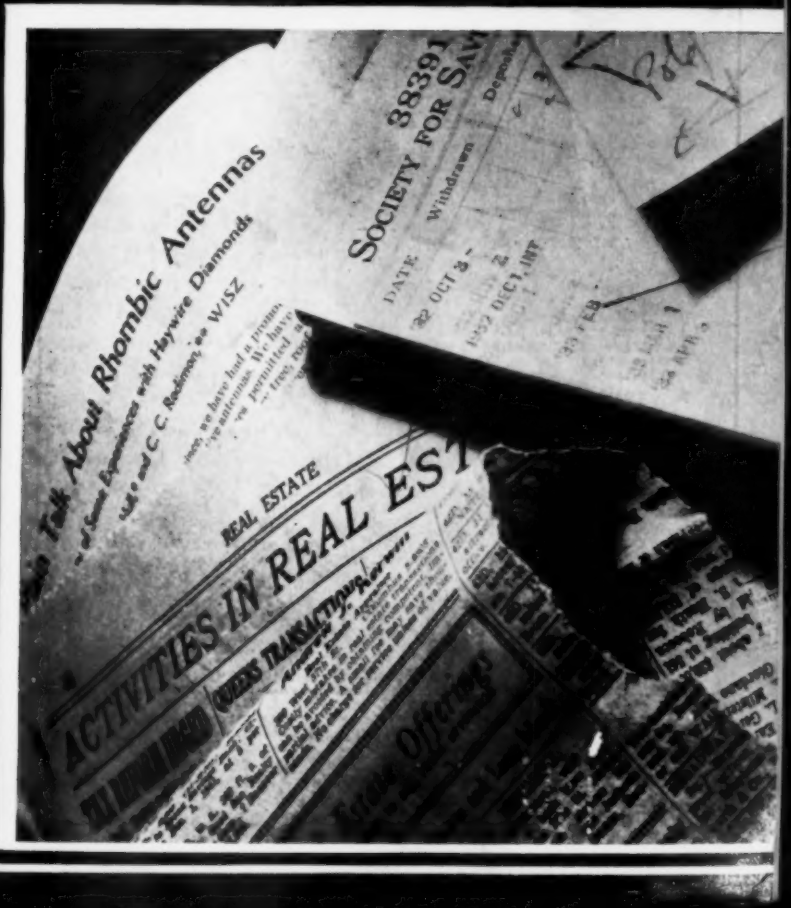
# QST

# amateur radio



RESEARCH LABORATORY OF PHYSICS

THE PHYSICS LABORATORIES
HARVARD UNIVERSITY
CAMBRIDGE MASSACHUSETTS

September 15, 1936

Mr. Arthur A. Collins
Collins Radio Company
Cedar Rapids, Iowa

Dear Mr Collins:

You will doubtless be interested in the following report of the performance of the 45A transmitter which was used on the Harvard University-Massachusetts Institute of Technology eclipse expedition.

Our geographical position was most unfavorable for United States signals, since they had to pass near the north magnetic pole. As a result, even the high-powered commercial stations were audible less than an hour each day. This made it impossible for us to communicate regularly direct with the United States. One fone and five cw contacts with the United States were all that were made during the months of operation. However, the transmitter was used a very great deal sending traffic to England and Sweden, whence it was relayed to the United States. Reliable schedules were set up and considerable traffic handled. Nearly all this was done on fone, as it was possible to cover all of Europe with a R8 to R9 fone signal on 14 mc. During our efforts to establish satisfactory traffic routings, contacts were made with amateurs in 28 countries and all continents except South America. Our call, URAD, was very well known in Europe by the time we left.

We were frequently complimented on the good quality of our voice reproduction. In many cases the transmitter was identified as a "Collins job" before we mentioned it, largely for this reason. The 45A transmitter seems to be widely and favorably known among the European operators.

We found the plug-in coil arrangement very handy, particularly the inclusion of the antenna coupling coil in the plug-in section. The inductive neutralization was found to be stable and easy to adjust.

The ease with which we could communicate with the "outside world" was a great convenience and satisfaction to those of us on the expedition.

Yours truly

H. Selvidge

H. Selvidge
Instructor in Communication Engineering

HS:A

# URAD

★

AN INTERESTING LETTER ON THE PERFORMANCE OF THE 45A AT AK-BULAK IN THE KAZAK REPUBLIC, NEAR ORENBURG, U. S. S. R.

★

## Collins Radio Company

CEDAR RAPIDS IOWA. U. S. A.

New York
11 West 42nd St.

Mexico City
Edificio "La Nacional"

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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

HIRAM PERCY MAXIM, FOUNDER

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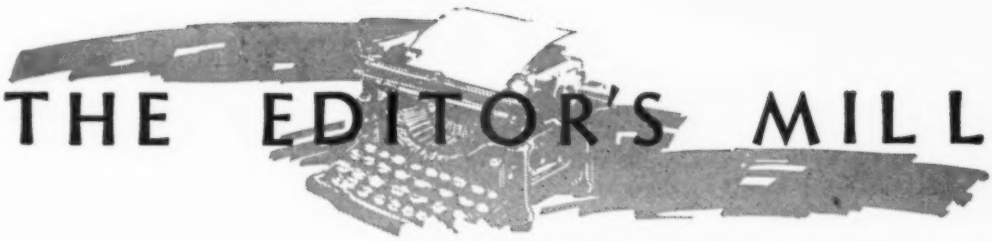


# THE EDITOR'S MILL

AS THE eventful year 1936 pulls its switches and coasts into history, it seems to us that it would be a good idea to cast a surveying eye back over the twelve months, take a look at what has happened and see where we are. It should be not only interesting but helpful in adjusting our perspectives. It is wholesome for every mortal to pause occasionally and take stock of his situation. It is with this feeling, then, that we blow the whistle and at double-time the events of 1936 again march briefly across the pages of *QST*.

While our story for the year is large with triumphs, the saddest event in the history of amateur radio occurred in middle February with the sudden passing of our much-loved founder and president, Hiram Percy Maxim, W1AW, and our estimable vice-president, Charles H. Stewart, W3ZS. Despite our successes in other fields, we are left with an ineffable feeling of loss in the passing of these splendid friends and leaders of our art. In May, as every amateur knows, Eugene C. Woodruff, W8CMP, and George W. Bailey, W1KH, succeeded to these respective offices.

Practical operating achievement and public recognition thereof made immense strides in 1936. The Great Flood of March produced, in fourteen eastern states, the greatest emergency in the history of our country and the greatest communication need of all times. Amateur radio operators met the responsibilities of the hour with flying colors. It was the most complete, spectacular and important demonstration of the public utility inherent in the amateur service in our notable history of such experiences. Invaluable work was also recorded in southern tornadoes, a Canadian mine disaster, and in Florida hurricanes and Texas floods. Attention was focussed on the importance of preparedness, amateurs became conscious of the need for possessing special apparatus for emergency work, and steps were taken to expand the A.R.R.L.'s Emergency Corps. Two successful field days were held, combining an outing with the testing of portable equipment. Routine traffic performance included valuable contact with several expeditions, as in the past. Service through the nationwide network of all-O.R.S. spot-frequency trunk lines was speeded by the creation of a national trunk-line net and through the inauguration of scores of section and local A.R.R.L. nets. It was a great year for placing emphasis on the high usefulness and value of amateur communication and amateur operators to their communities.

Interest in operating competitions was keener than ever. Besides announcements in coöperation with foreign societies, great variety was offered in A.R.R.L. contests for different groups. Only the highlights can be mentioned here. The ultimate in contact opportunities was given the fraternity through A.R.R.L.'s Eighth International DX Contest and the Seventh Annual Sweepstakes—the biggest events for testing stations, making operators top-notch, and providing just plain fun. The DX tests proved the most successful in history. In the "SS" a goal looked forward to for years was realized when at last one man worked all 69 A.R.R.L. sections in the short space of two week-ends! (W6ITH, O.P.S., did this on 'phone, using the 1.8- 3.9-, 14-, 28-, 56- and 112-Mc. bands!) Keen rivalry marked many an operating battle in O.R.S. and O.P.S. groups during the year. The use of low-frequency bands continued extensive, but 14-Mc. interest, occupancy and results increased substantially. With minor exceptions, DX conditions were the best ever, and many new W.A.C.'s were earned. The 28-Mc. band came into its own, with results equal to 14-Mc., the lower level of QRM inviting regular occupancy. The period of hailing 28-Mc. results with mouth agape gives place to stable occupancy, as this member of our family of bands takes on a real load of stations the world over—whenever, as now, solar conditions permit. Five-meter DX history was made in May, when the ionosphere misbehaved and permitted intercommunication between many middle-western and eastern amateurs. Interest in u.h.f. advanced, with frequency-stabilization technique to the fore. Clubs in several large cities developed methods to control 56-Mc. bootleg work, protecting the interests of members and the reputation of the fraternity.

The year was ushered in with announcement of a new W.A.S. objective. About 230 certificates were issued operators submitting proof of working forty-eight states. During the year the A.R.R.L. message form was changed to meet present-day requirements for fast accurate work. The F.C.C.

increased the minimum qualifications for amateur operating to thirteen words per minute, a step widely acclaimed throughout amateur ranks. The year is closing with organized activity at a higher level than ever before, and with renewed interest in the Rag Chewers Club and in general fraternizing. The limits and goals for amateur operating in the future—who can name them?

In the field of technical progress, the year not only brought substantial refinement in previously-established technique but also saw the introduction of a number of new practical aids to better communication. In receiver development the trend to increased use of superheterodynes has continued, both on the ordinary high frequencies and on ultra-high frequencies as well. Further improvements in receiver selectivity have been accomplished, particularly in single-signal sets employing the crystal filter circuits introduced in 1932 and '33. New circuits accomplishing a marked advance in reducing interference from "man-made" static have been especially significant, particularly the noise silencer developed in the A.R.R.L. laboratory and announced early in the year (February 1936 *QST*). Heterotone c.w. telegraph reception, giving the advantages of modulated c.w. transmission to aid in copying code, was another A.R.R.L. development (November), and the diversity-type receiver was introduced for amateur use with simplified single-control tuning (May). General receiver development was aided by the manufacture of new receiving tubes in both glass and metal types.

In transmitter development, the introduction of new-type transmitting tubes has resulted in simplification of r.f. and audio circuit design with improved flexibility and better performance. The most notable step in this direction came with availability of the beam power tubes, first in an audio receiving type (6L6), and later in r.f. transmitting types (807 and RK39). Further additions also were made to the line of transmitting pentodes, and several more efficient triode types made their appearance. Reasonably-priced low-temperature-coefficient quartz crystals have encouraged the trend toward crystal control, especially on the ultra-high frequencies, a number of crystal-controlled 28- and 56-Mc. designs being the result. New tubes especially developed for power use on frequencies ranging well above 300 Mc. have encouraged transmitter development in that region with simplification of circuit construction, as in the "trough-line" oscillator (September), and the attainment of greater power output with multi-tube arrangements (October).

Antenna development has been principally in the achievement of a better knowledge of the actual behavior of simple radiators (November) and in increased application of directional systems, a number of which were described throughout the year. Practical knowledge of wave propagation on amateur high- and ultra-high frequencies has been considerably furthered. Continued study of ultra-high-frequency wave propagation between Boston and West Hartford has given further proof of the bending in the lower atmosphere first described in June 1935 *QST*. Improvements also have been made in auxiliary apparatus, especially in measuring equipment using cathode-ray tubes.

With returning national prosperity and interesting new apparatus, radio trade increased mightily, bringing added advertising income to A.R.R.L. publications which was immediately reflected in a greatly-increased number of reading pages. *QST* contained 1322 pages for the year, a new high mark, averaging 110.7 pages a month (and we don't count covers) for twelve issues. The new *Handbook*, out in November, went over two pounds in weight, sold twenty-five tons of copies in its first month. A complete history of amateur radio was published for the first time, the story from the inception of the art down to the present day, an invaluable record.

On the Washington front it has been an active year, although accompanied by no changes in legislation governing us and but minor modifications in our regulations. No international conferences were held but the year was large with preparations for coming conferences, the technical meeting of the C.C.I.R. at Bucharest next year and the administrative conference at Cairo in 1938. A.R.R.L. actively participated in the preparations made for these conferences by the United States government. At the direction of the Board of Directors, the League made a determined endeavor to secure more frequencies for the amateur at Cairo but was unsuccessful in having such a suggestion incorporated in the United States proposals. Taking advantage of every legal means for reconsideration, three minority reports and appeals for review were taken to successively higher planning organizations, and arguments renewed in each case, to be met by the united opposition of every other American radio interest. We pause here to point out that this is in no sense a discriminatory action against us as amateurs but reflects the feeling of virtually every other radio interest and of all the government agencies that safety for the present allocations at Cairo lies only in a policy of leaving everything strictly as it is: despite the demonstration of need for more space by every service, only ourselves and the broadcasters eventually pressed for a change in the allocations, and both requests were overwhelmingly voted down. As the year ends, then, there is increasing amateur recognition of the hard fact that we shall probably have to rely upon further improvements in our technique for the relief we seek.

In June, one of the most extensive hearings in the history of communications regulations was

*(Continued on page 74)*

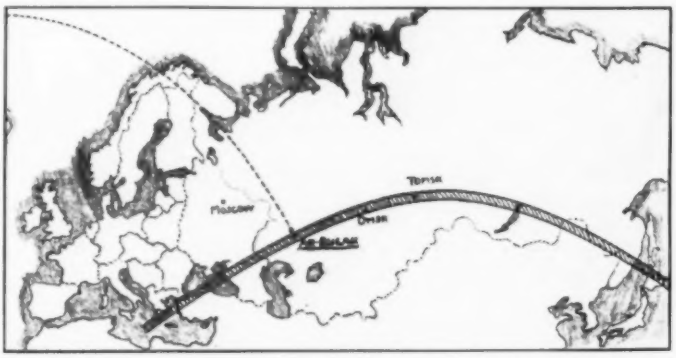
# Amateur Radio on the Harvard-M.I.T. Eclipse Expedition to Siberia

By H. Selvidge,* W9BOE

ON June 19, 1936, there occurred an eclipse of the sun, visible along a path of totality stretching from Greece across Siberia to Japan. Many expeditions from various countries were located along the path to make scientific observations, and the Harvard University-Massachusetts Institute of Technology expedition was one of these. Readers of *QST* will probably be interested in its activities on account of the large amount of radio equipment which was carried.

The expedition included two groups: One, the party of astronomers; and the other, the radio section. The astronomical members were interested in making spectograph studies of the corona of the sun during the eclipse. The radio party was also to make scientific observations. These were measurements of the various changes in the Ionosphere during the eclipse. The general problem of measurements of this kind was well discussed in the September *QST*,[1] and will not be described in detail here. Suffice it to say that we are particularly interested in Ionosphere measurements during an eclipse, since then the ultra-violet light from the sun is cut off suddenly, and affords better opportunities for studying its ionizing effects than during sunrise and sunset hours. It has long been supposed that the ultra-violet light was the cause of the ionization in the upper atmosphere, but some have held that there might be other agencies, and further checks were desirable to settle this point. Measurements were made during the eclipse of 1932 [2] in New Hampshire by Cruft Laboratory of Harvard University, and the ones of this year were designed to add further data to that already obtained. This was desirable, since the measuring technique had been considerably improved since 1932.

Measurements were made by the fixed-frequency and variable-frequency methods. Examples of virtual height records obtained by these two methods are shown in the previously mentioned paper.[1] There were two transmitters used for the fixed frequency work. Each used an exciter with two 53-type tubes and one RK23. Each crystal-controlled exciter unit drove a final amplifier using two RK28's. A simpler rig would have worked for a single frequency, but a great deal of flexibility was desired, both for the expedition work and for future use. These transmitters could work in the 80-, 40- and 20-meter amateur bands if desired. They were modulated with a pulse modulation from a thyratron circuit, but could be rapidly changed over for c.w. operation. The variable-frequency transmitter was designed to cover the range from 2 to 8 Mc. in a continuous sweep without having to change any coils, with single-dial control, and constant output over this range. This was accomplished by an oscillator using two 852's with the tank coil consisting of a variometer (wound of ¼-inch copper tubing) ganged with the tank condenser. The frequency was changed by a motor drive which could be operated from the receiving position, normally about three-quarters of a mile from the transmitters. The pulses for this transmitter were furnished by a motor-driven chopper.




*LOCATION OF THE EXPEDITION IN THE PATH OF THE ECLIPSE*

The receiving equipment included three FB7 receivers with pre-selectors for the fixed frequency work, and an HRO Junior for the variable frequency receiver. There were also various motor-driven photographic recorders for recording the virtual heights.

### COMMUNICATION EQUIPMENT

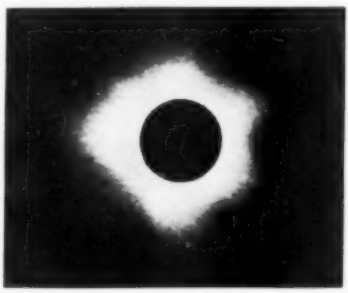
In addition to the measurement equipment, we

* Cruft Laboratory, Harvard University, Cambridge, Mass.

[1] G. W. Kenrick, "The Kennelly-Heaviside Layer," *QST*, Sept., 1936.

[2] R. W. Woodward, "Amateur Observations During the (1932) Total Eclipse," *QST*, Jan., 1933.—EDITOR.

carried two transmitters and receivers for communications work. The party was to be stationed at the town of Ak-Bulak on the eclipse path, and the radio equipment was to be set up there, in the town, where power was available. A Collins 45A transmitter was provided for communication purposes and it was planned to try to keep a regular schedule with W1XJ at the laboratory in Cambridge, Mass. It was also to be used to communicate with the astronomical camp, eight miles from town. This transmitter was equipped for operation on the 80-, 40- and 20-meter amateur bands, as well as on two experimental assignments in the vicinity of 17 and 24 meters. We hoped that with this variety of frequencies available we would have few communications difficulties. More of that later.



*A SHOT OF THE ECLIPSE TAKEN BY THE AUTHOR*

At the astronomical camp we had a Western Electric 19A aircraft transmitter. This is a small two-tube crystal-controlled set with 15-watts output on c.w. and 5 watts on 'phone or m.c.w. It was powered by a dynamotor run from storage batteries. This transmitter uses two of the WE307A tubes, and is unusual in that the r.f. amplifier tube is modulated directly with the microphone transformer in its suppressor grid, and uses no audio amplification. At the radio camp the communications receiver was a National HRO and at the astronomical camp a Hammarlund Super-Pro was used. This latter was also used for the reception of time signals for checking the astronomer's chronometers.

As we expected to find ourselves in a rather primitive section of the world, we had to take along all conceivable kinds of supplies, and we had all sorts of spare parts for everything that might possibly break down. For example, we tried to take at least two spares for every tube needed. Our radio equipment used 98 tubes of 35 different types. And with the exception of two receiving tubes broken on the return trip, we did not have a single tube failure or casualty. This speaks well for our present day tubes, as our poor voltage regulation put a severe strain on our equipment. Much of it was running 24 hours a day. However, line voltage fluctuations blew the input condensers on nearly all of our low-voltage power supplies, and after using up all our replacements we operated all our low voltage filters with choke input.

We had to take various supplies such as wire, insulators, pole climbers, soap, solder, photographic chemicals, tools, glue, fans, bedding, shoestrings, lights, sand and emery paper and hundreds of other items such as those. We did not depend upon getting any supplies at the eclipse site, with the exception of food. However, we provided a small quantity of canned food, just in case we didn't get along on the Russian food, but these food supplies turned out to be merely appreciated luxuries and not at all necessary, as we were well fed.

Our apparatus and equipment was packed in some 37 boxes, lined with tarpaper to help keep them dry. On the way over, one of our party was on the spot whenever the boxes were transferred from one boat or car to another, and each box was checked off as being present. Large numerals were painted on each box to facilitate this operation. This procedure was a fine insurance against loss of equipment and mental equilibrium, and is highly recommended. The only time we failed personally to check our equipment (once on the return trip) it was put on the wrong boat.

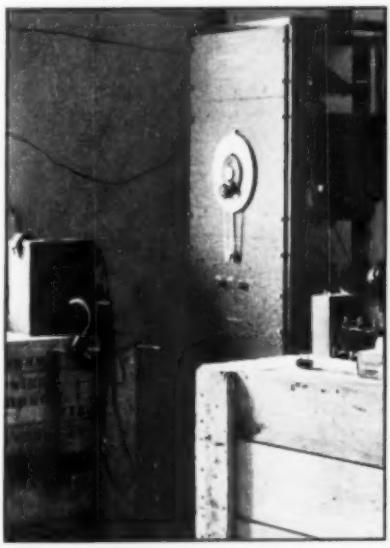
### COMMUNICATION DIFFICULTIES

We sailed from New York on April 8th and arrived at Ak-Bulak the second week in May. We passed through Leningrad on the first of May, and saw the huge parade which is held on that day. We then went by rail to Ak-Bulak *via* Moscow. The publications which were sent out in advance describing the eclipse sites had said that at Ak-Bulak we would find a local power plant delivering 220 volts a.c. at 50 cycles. We had expected to find large voltage variations and so took along numerous tapped transformers, as well as variable auto-transformers (Variacs). But you can imagine our consternation when we arrived in Ak-Bulak and found that there was nothing but d.c. in the town. The embarrassed authorities got busy and rounded up an a.c. generator from a nearby town and belted it to a big diesel engine which ran the local grain mill. The mill was shut down for the duration of our stay, and a transmission line was strung for our supply.

A month had elapsed before this arrangement was completed, and in the meantime we had run some of our receivers on batteries and made a very discouraging discovery. European signals were very plentiful on the 20-meter band, but except for about an hour in the morning (0100 G.T.) it was impossible to hear any W stations. Even then, they were quite weak, and often several days would go by without any being heard. This was with a directive antenna pointed toward the U.S. East Coast. Even the high-powered American short-wave broadcasting and commercial stations were seldom heard. This was probably on account of the signals having to pass near the north magnetic pole. We had expected that this

would give us trouble, but not nearly so much as we experienced.

As a result of this discovery, we did not try to maintain any schedule direct with the laboratory station, W1XJ, but turned to amateur radio. Fortunately we were prepared for this difficulty, having previously obtained permission from the Soviet government to communicate with stations in other countries for the purpose of relaying messages in the event we were unable to communicate directly with our laboratory station. The U.S.S.R. government was very generous to us in these matters, granting all our requests for frequencies, calls, etc., without question. The portable transmitter UAST operated from the astronomical camp on 7 Mc., while outside traffic was handled in the 14-Mc. and on the 45A *via* amateur radio relays. The 45A transmitter signed URAD on 'phone and UIBWF on c.w. Since we found that we could cover Europe with an R8-9 'phone signal, most of the traffic was handled by voice. This facilitated making the relay arrangements, since we could more fluently explain our requests for message relays. In this connection we wish to thank the many amateurs whose calls we cannot mention, who risked official disfavor to help us get our traffic into the United States. These included amateurs in England, Germany, Ireland, Japan and Egypt. Fortunately we can publicly thank one of our outstanding relay stations, SM5SX in Stockholm, Sweden, whose operators lost many hours of sleep to help us out. In order to diminish the magnitude of the risks run in our behalf, we tried to limit the messages as much as possible to those immediately concerning our technical work. There were many of these, on account of difficulties occasioned by our late start because of the power trouble.



*THE VARIABLE FREQUENCY TRANSMITTER SET UP AT AK-BULAK*

During our stay in Ak-Bulak we were on the air from about May 20th to June 25th. During that time we worked 28 countries and all continents but South America. Doubtless we could have worked it also, if we had had time, but most of our contacts were made in an effort to get a satisfactory traffic schedule set up, and we did not have very much time for rag-chewing. We worked into the United States on six occasions with six different stations, including our laboratory station W1XJ. Five of the contacts were on c.w., the other on 'phone with W2MJ. We have since had several reports of our 'phone signals being heard in this country. We were located in Asia by about 20 miles, and as a result helped several amateurs to get their WAC 'phone certificates. Usually we would hear more American 'phone stations than American c.w. stations on the 20-meter band.

### LAYER-HEIGHT MEASUREMENTS

Our measurements went on 24 hours a day, through the eclipse, and for a week afterward. The day of the eclipse and the day following, (June 19th and 20th) there was a world-wide magnetic storm which caused nearly all signals to drop out at our location. The storm also affected the records taken during the eclipse, as it decreased the ionization in the layers. However, this effect was mostly noticeable on the higher frequencies, and the eclipse effect was beautifully shown on the low-frequency records and to a lesser extent as the frequency was increased. But the storm by no means destroyed the value of the records, as was feared. A preliminary analysis of these records verifies previous assumptions that the ionization is almost entirely caused by ultra-violet light and that any effect of radiation traveling at speeds other than the velocity of light is small. That is to say, the radio effect reached its maximum at the same time as the optical eclipse. It might be added that this checks the data which were taken during the eclipse of 1932.[2] We were also fortunate in having good weather for the astronomical observations. The radio measurements, however, did not require that the sky be clear, and the weather was not one of the radio party's worries.

Except for the aforementioned difficulties with our power supply and filter condensers, the radio apparatus gave little trouble. The transmitter room caught on fire the last morning of operation, but little damage was done. The fire was extinguished by the night operator who sensed trouble and pedalled his bicycle madly over the three-quarters of a mile to the transmitter room when the power failed. The receiving equipment for the measurement work, as well as all the communications equipment, was set up in a baggage car placed on a siding, along with the private railroad car which was our home for two months. The transmitters were located in a mud house at the power station at the grain mill.

After the party broke camp and packed, we

took a trip up the Volga by steamer, and then declared a vacation and split up our group, each member returning home according to his inclination and the state of his pocket book. Some of us stopped and visited some of the friends we had made on the air from Ak-Bulak. And so another page in the long history of amateur radio was finished.

The combined expedition was headed by Dr. Donald H. Menzel of the Harvard Observatory, who is also W1JEX. The radio party was under the direction of Prof. H. R. Mimno of Cruft Laboratory, who was unfortunately unable to make the trip, but kept in touch with us *via* radio. The members of the radio party were Paul

(*Continued on page 39*)

# The Governors-to-President Relay

## January 19th (5 p.m. E.S.T.) to January 20th (5 p.m. E.S.T.)

THE President of the United States will be inaugurated on January 20, 1937. This will be the fifth opportunity in the history of amateur radio for amateurs to relay messages successfully from the governors of each state and territory to the chief executive of the nation, on the occasion of his inauguration. The Washington Radio Club's president, W3ER, tells us that plans have been concluded for the receipt of the messages and delivery to the president. The line-up of Washington club stations is the most extensive ever!

Every active U. S. amateur with a station on the air should be interested in helping in this relay. The messages will all start from designated amateur stations at 5 P.M. E.S.T. (4 P.M. C.S.T., 3 P.M. M.S.T., 2 P.M. P.S.T.) January 19th. The relay will continue until the same hour January 20th. At its conclusion all messages received in Washington will be delivered at the White House. Plans have been made to start the traffic [1] at the same time from all forty-eight states and the territories right at the start of the relay.

Help us to show President Roosevelt that amateur radio communication is responsibly conducted, that our communication facilities are both prompt and accurate and that we operators know our stuff 100%. All hams are cordially invited to coöperate in the relaying of these dozens of messages that will be converging on Washington, D. C., on this occasion. Some of the governors' messages will be long ones. Polish up your station equipment and "make it a night" January 19th. Handle messages whenever you can, but be ready to QRX and assist in copying, as well as QSP, if QRM or other difficulties appear.

Here are some suggestions for effective working: (1) Make calls short, breaking them with listening periods. (2) Listen more than transmit. (3) "CQ east," or call ORS or trunkliners who are on the job if you are out in the wide-open spaces and have the all-important message to move. (4) Keep going; help Washington stations all you can in looking for messages until they are all "in the bag."

Washington stations will CQ GPR de W3— each time before they comb the bands for G.P.R. traffic. Here is a list of Washington radio club stations standing ready to receive your messages (sent us by radio from W3BWT-W3ER).

| | | | |
|---|---|---|---|
| W3BWT 3548 kcs. | W3ESP 14,060–14,376 | W3GGX 7004–14,008 | W3FQR 7030–7115 |
| W3ER 7060–14,010 | W3FYJ 3535–14,374 | W3FQB 7060–14,332 | W3GKU 3504–7008 |
| W3CDQ 7040 | W3EUJ 3587–7174 | W3AWS 3550–7005–14,290 | W3EUG 3800 |
| W3FGG Any 14-Mc. freq. | W3DXJ 7110 | W3CYO 3852.5 | W3CIZ 3850 |
| W3FVD 7171–7290 | W3CZE (any band) (14,245 fone/cw) | N3EEN 3790 | W3EZN 7290 |
| W3GGA 14,223 | | W3FPQ 3610–7065 | |

In addition, regular W1INF (Hq) schedules will be set aside the Tuesday night of the relay to enable scheduled stations, as well as Hq. to assist. W3BWT will be the key station, as in the successful '33 relay, with W3CDQ, W3EMO and W3CJT assisting.

Reporting: send A.R.R.L. complete copies of the message(s) you handle in connection with this relay promptly, please. Show time received, time forwarded, and both, or all stations with whom handled. A file of traffic showing the consecutive handling of the message of each state is essential, so we can show complete routes, and give you full credit for your work in *QST*.

—*F. E. H.*

[1] Each Section Manager in whose territory there is a state capitol is designating an amateur to approach and secure the message from his governor. It will be addressed to President Roosevelt for transmission in the relay. We are depending on each operator so designated by his SCM to do his level best to get a message and see it started on its way properly.

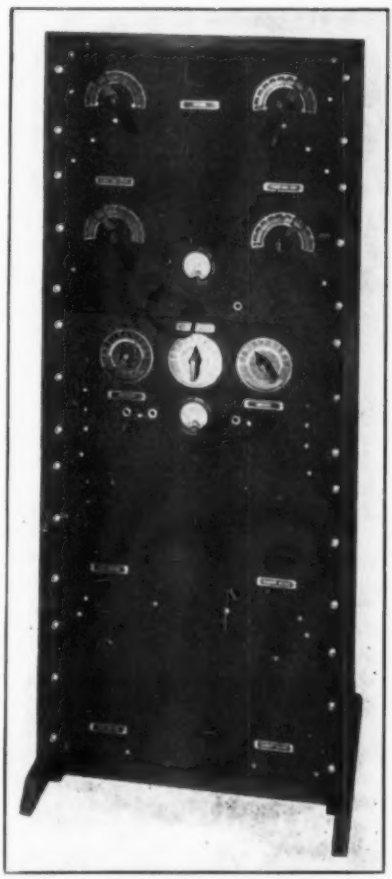
# Boosting the Output of the Low-Power Transmitter

## A T55 Final Stage for the Popular Four-Band Type 10 Rig

By Vernon Chambers,* W1JEQ

WHEN the 47–46–10 low-powered rig was described in August 1936 *QST*, the statement was made that with the addition of one or more tubes, a decided increase of power could be had. With this thought in mind an experimental final stage was rigged up to determine what type tube could be satisfactorily driven by the Type 10 and yet give a worthwhile increase of power over the existing layout. The T55 stepped up and presented itself with rated output increase of around 130 watts, bringing the final power to the neighborhood of 160 watts. A few very minor changes in the driver (the 47–46–10 combination) permit efficient operation on four bands, with the entire rig perking from 3.5 Mc. to 14.4 Mc. with the use of only one 3.5-Mc. crystal. The driver has proved popular enough to win a place in the 1937 edition of the A.R.R.L. *Handbook* and therefore we feel that the addition of the T55 stage will meet the requirements of those desiring an economical power increase.

The photograph shows that the final is a single-ended affair with not too many parts to necessitate going on a spending spree. With the exception of the grid and filament by-pass condensers, the plate lead r.f. choke and the grid leak, all of the gear is mounted and wired on top of the baseboard. The panel and baseboard measurements are 10½ by 19 inches and 10½ by 17 inches respectively. Tempered Masonite is used for panels and bases throughout the entire transmitter. The plate and grid tuning condenser frames are grounded, thus permitting their mounting on the panel without fear of hand capacity effects. To eliminate the possibility of a dangerous shock, the plate meter jack is placed in the negative high-voltage lead. The two tuning condensers are each centered between the top and bottom of the panel and four inches in from the outer edges. The meter, which serves for both plate- and grid-current readings, is centered in the middle of the panel and slightly up from the bottom. The tube socket can then be put in the exact center of the baseboard, leaving enough room between the tube and tank circuit for the neutralizing condenser which is supported by a small stand-off insulator. The grid and plate coils are set up directly back of their respective condensers.



THE COMPLETE TRANSMITTER WITH ITS POWER-BOOSTING T55 STAGE THE SECOND UNIT FROM THE TOP

Coupling between the driver and the final grid circuit is easy with the aid of two jack-top feed-through insulators set into the baseboard in the rear of the grid-coil, with their jacks placed on the under side of the base. A link consisting of a length of twisted pair with a set of G.R. plugs fastened to one end may be plugged into the jacks very conveniently. Two jack-top stand-off insulators are mounted at the plate end of the tank coil of the amplifier. These insulators are wired in parallel with a pair of binding posts mounted at the rear edge of the baseboard. The link, which can be made of self-supporting wire of a diameter to fit inside the coil or else of a flexible wire wound around the coil, is also equipped with a set of G.R. plugs which plug into the insulator jacks. A five-screw terminal strip, to the rear of the grid circuit, serves as a connecting point for fila-

*QST* Laboratory Assistant.

ment, grid and ground external connections. Positive high-voltage is brought to a feed-through insulator located at the rear and center of the unit.

Two small right-angle brackets of the ten-cent store variety hold the panel and baseboard together while two lengths of half-inch brass strip reach from the panel's top edge to the corners of the baseboard. It is not a bad idea to purchase enough of the angles and brass strip to supply the needs of all of the units, since they are all supported in the same fashion with the exception of the driver which, because of its compactness and sturdiness made this method unnecessary. In the driver's case, two angles of about twice the size of the others, mounted at the very front edges of the baseboard, add all the support needed. Of course the driver baseboard dimensions are the same as those given in the previous article; but for one who plans to build the entire rig from scratch it would be a better idea to make this base the same size as all the others.

Underneath the base and held by one of the machine screws holding the tube socket in place, a five-lug terminal strip is mounted. The filament connections are made to the two end lugs while all leads at ground potential are brought to the center lug. The two extra lugs on the strip can be clipped off, thus leaving a little insulation between the filament leads and those going to the center tap. The small Carter jacks, used to enable the use of one meter for both plate and grid purposes, have three connection points on them. One of these points has a positive indication on it. This is connected to the center terminal. When wired into the circuit, the connections are made to the points on either side with care to prevent the meter from reading backwards. This is best done by making temporary connections to the jacks at the time of construction and then later fixing them permanently after the right polarity has been determined.

### THE DRIVER

As mentioned previously, a few minor changes have been made in the driver to adapt it to the job of driving the final. These changes consist of a new panel measuring 8 by 19 inches and a change in the Type 10 circuit. The circuit as it now stands is shown in Fig. 1 and is also described in Chapter 9 of the new edition of the A.R.R.L. *Handbook*. To allow better efficiency for operation at 14 Mc. (since the Type 10 is now used as a doubler at that frequency) we have added 25,000 ohms to the grid-leak and also have added eight turns to the 14-Mc. doubler coil. With these extra turns on the coil the grid lead from the 10 to the 46 is moved from its original position to the very end of the new winding. This has been done to load up the 46 in order to get a little more excitation. A 250-$\mu\mu$fd. condenser is put in parallel with the grid coupling condenser for the same purpose. As quite a few of the fellows have already built this rig, we did not want to cause them to rebuild their coils in order to adapt this unit to the T55, so the links from the exciter coils to the final are therefore made by merely winding a few turns of insulated No. 18 wire around the coils of the Type 10 tank circuit and equipping their ends with a set of G.R. plugs.

The plugs then fit into a pair of jack-top stand-offs which are wired in parallel with two binding posts in the same fashion as those of the final. This insulator and binding post set-up is arranged in a half-circle around the driver coil socket. A twisted pair is then run from the binding

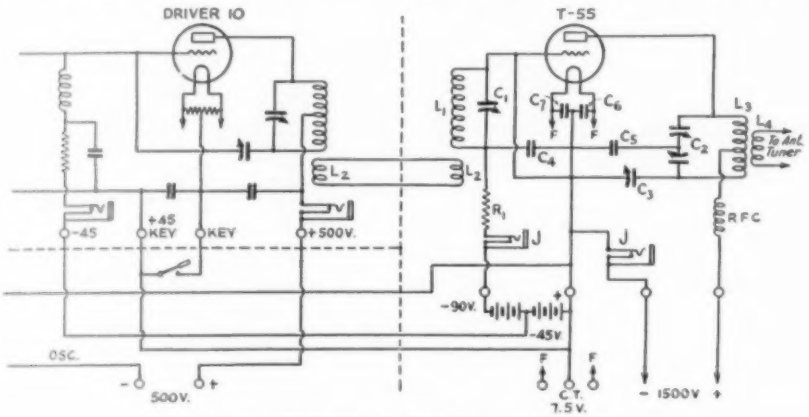



*FIG. 1—CIRCUIT OF THE T55 AMPLIFIER*

*$L_1$ to $L_4$—See coil table.*
**$C_1$—105-$\mu\mu$fd. receiving type variable grid condenser (Cardwell MR 105 BS).**
**$C_2$—210-$\mu\mu$fd. split-stator tank condenser (Cardwell XT 210 PD).**
**$C_3$—5-$\mu\mu$fd. neutralizing condenser (Cardwell NA 5 NS).**
**$C_4$—0.01-$\mu$fd. mica receiving condenser.**
**$C_5$—0.001-$\mu$fd. 2500-volt mica transmitting condenser.**
**$C_6$, $C_7$—0.002-$\mu$fd. mica receiving condensers.**
**$R_1$—3500-ohm 10-watt resistor.**
**RFC—2.5-mh. r.f. choke (National Type 100).**

posts to the link jacks of the final stage. The number of turns needed for these links is shown in the coil chart. Another change concerns the meter jacks. Originally the four jacks ran in this order: Nos. 1, 3 and 4 for the reading of the plate currents of the respective stages, with No. 2 acting as a plate voltage switch for the doubler. These have been rearranged so that Nos. 1 and 2 are in the oscillator and doubler plate circuits, No. 3 is in the 10 grid circuit, and No. 4 is in its plate lead.

### COILS

Almost all that need be said about the various coils and links has already been told with the exception of those of the final. For this circuit a set of Barker and Williamson coils of the BX series is used. These coils are constructed for work with neutralized amplifiers operating at powers up to 200 watts and are rigid affairs complete with center-taps. Their dimensions are given in the coil table. Since the driver and grid links are wound on the coil forms, this leaves only those of the final tank circuit to think about. A single turn of No. 12 wire, with G.R. plugs at its ends, does the trick nicely. If the link is wound of a diameter slightly smaller than that of the coil with which it is to be used, it will be found that a change of coupling can be made by decreasing or expanding its diameter. The link, of course, fits inside the final coil and is made with leads just long enough to allow the turn itself to be placed at the center of the coil.

### POWER SUPPLY

Fig. 2 shows the amplifier power supply and also the primary connections to that of the driver, the idea being to show the proper way in which to connect all of the primaries together, thus enabling a row of toggle switches on the operating table to control the various units from the operat-

*REAR VIEW OF THE COMPLETED ASSEMBLY*

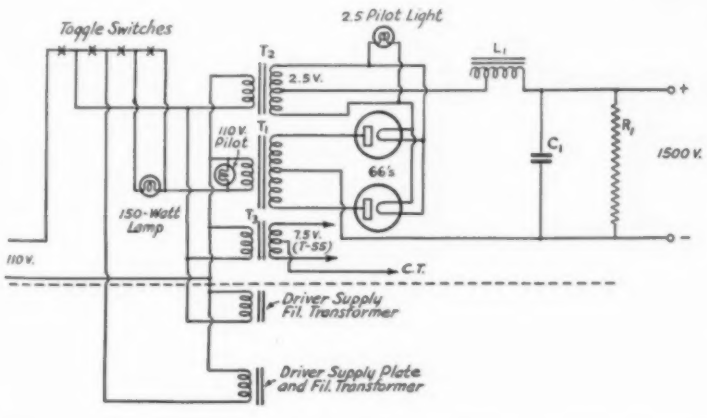
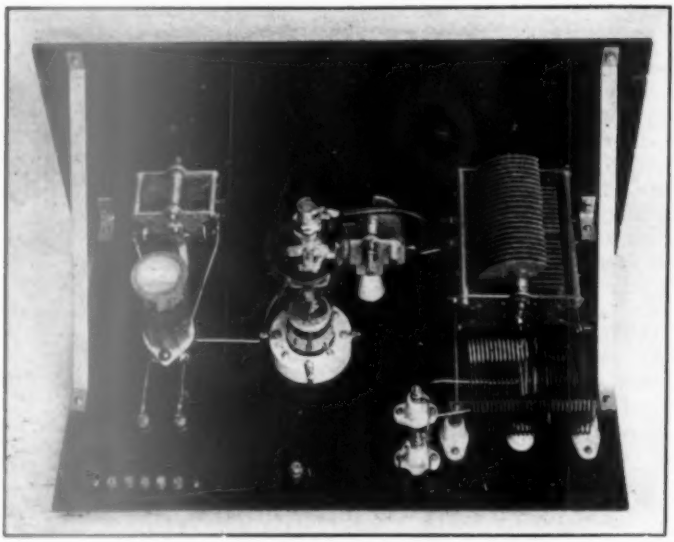



*FIG. 2—THE POWER SUPPLY CIRCUIT*

*$L_1$—10-henry 200-ma. smoothing choke (U.T.C. Type PA-102).*
*$C_1$—2-μfd. 1500-volt filter condenser (Aerovox 1505).*
*$R_1$—100,000-ohm 50-watt bleeder resistor (Ohmite).*
*$T_1$—1500-volt c.t. 250-ma. plate transformer (U.T.C. Type PA-116).*
*$T_2$—2½-volt c.t. 10-amp. filament transformer for two 66's (U.T.C. Type PA-34).*
*$T_3$—7½-volt c.t. 6.5-amp. filament transformer (U.T.C. Type PA-122).*

ing position. The front view of the transmitter shows the two supplies at the bottom of the rack, with the final supply at the bottom and the driver's next up. Both panels are 10½ by 19 inches, the high voltage supply base being 10½ by 17 inches, while that of the driver is 7 by 17 inches. The same can be said for this base as that of driver unit; that is, if one is building the whole outfit from scratch the best idea is to make the various units of the same size and at least large enough to allow freedom for arranging and wiring. The lamp-base shown is for the insertion of a 150-watt bulb for the purpose of reducing power during adjustment and tuning of the final. Four pilot lights are wired into the two supplies, one for each plate and filament circuit of each unit. With the exception of the large plate supply, all of the pilot lights are wired to 2.5-volt filament circuits. The low-voltage plate transformer has an extra 2½-volt winding which serves for the pilot light of that circuit. For the high-voltage supply, a 110-volt light is used, which is inserted in the primary leads. Both units are supported in the same fashion as the other stages. To reinforce the mounting of the T55 supply, the brass strips are fastened to the corners of the two transformers located at the rear of the base. This helps to keep some of the weight off the Masonite baseboard. It will be noticed that the filter choke of this unit has three taps on it. These taps, numbered 1, 2 and 3, are not all used. The d.c. input goes to tap No. 2 and the output is taken from tap No. 3. This arrangement gives all the filtering needed, but should an extra condenser be desired it

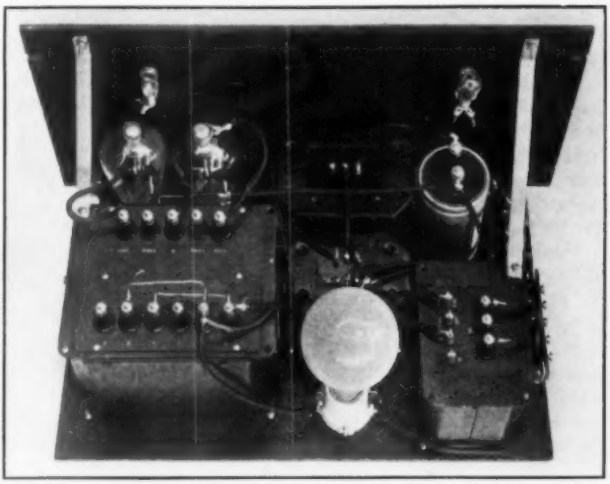


*THE FINAL STAGE VIEWED FROM THE REAR*
*The grid input circuit is at the left, the plate tank at the right.*

| *Grid Coil Specifications ($L_1$)* | | | | | *Links* |
|---|---|---|---|---|---|
| *Freq.* | *No. Turns* | *Wire* | *Length Winding* | *Diameter* | *($L_2$)* |
| 1.7 Mc. | 59 c.w. | No. 24 d.c.c. | 11/16" | 1½" | 9 turns c.w. |
| 3.5 " | 34 " | " | 15/16" | " | 7 " " |
| 7 " | 20 s.d.w. | " | ⅜" | " | 2 " " |
| 14 " | 6 " | " | ⅜" | " | 2 " " |
| *Plate Coil Specifications ($L_3$)* | | | | | *($L_4$)* |
| 1.7 Mc. | 32 " | No. 14 enameled | 3⅜" | 4" | 2 t. 3" diam. |
| 3.5 " | 28 " | " | " | 3" | 1 t. 2½" diam. |
| 7 " | 18 " | " | 3 | 2½" | 1 t. 2" diam. |
| 14 " | 10 " | " | 2¼" | 2" | 1 t. 1½" diam. |

"C.w." indicates turns close-wound; "s.d.w." indicates turns spaced diameter of wire.
The grid coils are wound on Hammarlund SWF 4 coil forms. The grid links are spaced from the main winding by 3/16-inch.
To add a larger amount of capacity to the tank circuit on 14 Mc., the B&W BX 20 coil is cut down to 10 turns.
No. 12 enameled wire is used for link coils $L_4$.

may be connected from tap No. 1 to ground. The two T55 filament leads and the transformer primary leads are brought to a five-screw terminal strip mounted on top of the base with the aid of small angle brackets. If a three-screw strip is mounted at the left end of the driver supply, and the primary connections made to that, the two supplies can then be wired together directly at the rack, providing more convenient wiring of the toggle switches and the a.c. lines.



THE 1500-VOLT POWER SUPPLY FOR THE FINAL STAGE

*The 150-watt lamp is used to drop the primary voltage of the plate transformer for tuning-up and adjustment.*

### THE ANTENNA TUNER

Prescribing the "best" antenna tuner for one to use is like a doctor trying to cure a patient by correspondence. Therefore we shall not go into a great amount of detail about this particular one, except to say that it is the tuner described on page 196 of the A.R.R.L. *Handbook*. It is interchangeable, making possible its use either as a series or parallel combination. The picture of the back of the transmitter shows most clearly its layout, and the circuit is shown in Fig. 3. The tuner may be used with either a single-wire or a two-wire feed antenna system, this being made possible by the switch shown in the diagram. Unless a fairly heavy switch is used it is a better idea to substitute a pair of small copper clips, as is done here. Since operation from 3.5 Mc. to 14 Mc. only was planned, the coil used is not quite as large as that which would be needed to include 1.7 Mc. For that reason the coil specified is the same as that in the *Handbook*. Of course, every ham has his own ideas about his pet antenna system, so for that reason the reader is referred to the variety of systems described in the A.R.R.L.

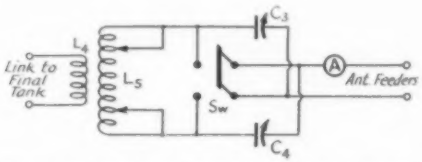



FIG. 3—CIRCUIT OF THE ANTENNA TUNER

*L5—2 turns No. 12 wire, diameter 2½ inches.*
*L6—24 turns No. 12 wire, turns spaced to occupy a winding length of 3½ inches. Coil diameter 2 inches.*
*C3, C4—300-μμfd. variable transmitting condensers.*
*With Sw connected, tuning condensers are in parallel. With Sw disconnected, condensers are in series.*

*Handbook*. Any of the various systems will serve when applied in the correct manner.

### FINAL TUNING

With the various coils, complete with their links, plugged in their proper places, the driver is first tuned to resonance. The thing to aim for is the transfer of full excitation to the final grid circuit. The grid current of the final amplifier should be about 40 ma. This may require slight readjustment of the links on driver plate and final grid coils. Care must be taken to prevent overloading the driver by overcoupling. A good thing to keep in mind is that a link of a few turns tightly coupled is more effective than one of many turns loosely coupled. When the proper adjustment has been found we next tackle the neutralizing of the final. Without plate voltage on the T55 and with its load disconnected, a neon bulb is held to the plate end of the tank coil. The circuit is then tuned to resonance (indicated by maximum r.f. glow in the bulb). The neutralizing condenser is then rotated until the r.f. is reduced as much as possible with the plate tank condenser readjusted to resonance. This procedure is continued until the very minimum indication of r.f. in the plate tank is had. These adjustments may throw the grid circuit off slightly and therefore this circuit must be rechecked from time to time. When coupling the antenna tuner, the safest method is to do so using low power; that is, with the 150-watt lamp in series with the plate transformer primary. When the tuner has been adjusted for best loading of the final at reduced plate voltage, the full high voltage may be applied. It will be found that when the tuner is adjusted for amplifier plate current of 50 ma. (indicated on the plate milliammeter) using the low power, the application of the full high voltage will bring the total plate current of the T55 up to around 150 ma., the rating for the tube. The correct coupling for proper loading may be ad-

*(Continued on page 59)*

# The 807 as a Crystal Oscillator

By John Stiles,* W8PNL

THE advent of the 807 chased this particular radio bug into a huddle with himself and friends. The general idea of beam power is very interesting—as expressed in the 6L6, at any rate. This, coupled with a special beam-power high-frequency tube like the 807, was just too much for Scotch instinct to neglect. Accordingly, herewith are pictured the desires, the methods, and the results.

First, primary desire was a high degree of reliability and efficiency. Second was the necessity for starting small and yet being able to add on later with a maximum of economy and a minimum of change. To these requirements, the 807 is an almost perfect answer. The desire for reliable local work, that is, three- or four-hundred miles consistently, led to a choice of a straight pentode circuit such as has been previously outlined in *QST* for the 6L6. Also, it led to a choice of the 80-meter band.

The circuit of Fig. 1 shows the particular values chosen after a long series of eliminations. No attempt has been made to design the best possible job for all 807's. For this particular tube, however, and the particular antenna (a full wave Zepp) every value of $E$, $I$, $L$, $C$ and $R$ has been checked and double-checked and found to give the most *stable* power in the antenna. With the exceptions of two items, the constants were not found to be particularly important in their relation to satisfactory operation. Nor were they found to be different from the values used with the 6L6. The two critical items are $C_2$, between the grid and plate, and the connection between heater center-tap and the low-bias side of the cathode (ground). Operation was successful without $C_2$, though it has an important bearing on power input and efficiency. But do not operate your tube without a permanent connection between heater center tap and cathode. This connection wants to be on the oscillator side of the key if center tap keying is used. If this connection is not made, the tube will spark across the stem when the key is open.

The photograph of the oscillator was taken with antenna coils removed to illustrate better the compact and solid layout obtained. $C_2$ in the present job is about six inches of the all-rubber

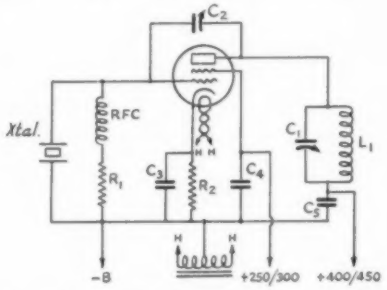
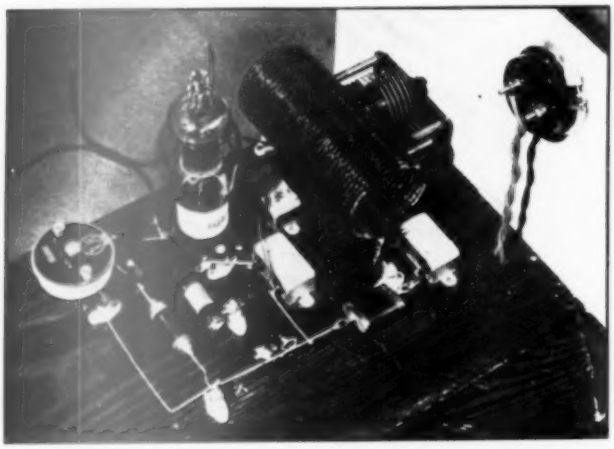



*FIG. 1—CIRCUIT OF THE 807 OSCILLATOR*

*$C_1$—100-$\mu\mu$fd. variable.*
*$C_2$—6 to 8 inches of all-rubber lamp cord, pulled apart to give optimum capacity.*
*$C_3$, $C_4$, $C_5$—0.01 $\mu$fd., 500-volt.*
*$R_1$—13,000 ohms, 2 watt.*
*$R_2$—400 ohms, 10 watt.*
*RFC—Short-wave choke.*
*$L_1$—30 turns No. 12 enamelled, turns spaced diameter of wire; coil diameter 2¼ inches. Wound on celluloid strips cemented with Duco cement.*



*THIS TETRODE OSCILLATOR USING THE 807 MAKES AN EFFECTIVE LOW-POWER 3.5-MC. TRANSMITTER*

*It can, of course, also be used to drive a following amplifier or doubler. The antenna coupling coils were removed to show more clearly the arrangement of parts. Note the lampcord coupling condenser, $C_2$, in Fig. 1.*

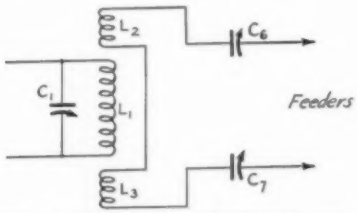



*FIG. 2—ANTENNA COUPLING FOR ZEPP FEEDERS*

*$L_2$, $L_3$—Each 10 turns same as $L_1$. Coupling about ½ inch at each end.*
*$C_6$, $C_7$—350-$\mu\mu$fd. receiving-type variables.*

* ex8DDV, 8UF, Clarkson College, Potsdam, N. Y.

lamp cord sold at dime stores. This cord easily pulls apart to vary the capacity. It is probably not as efficient as it should be, but it does the job very nicely. A lot of worthwhile "rigging around"

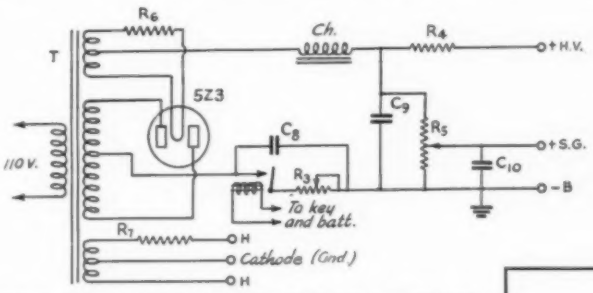



FIG. 3—DIAGRAM OF POWER SUPPLY, SHOWING ONE METHOD OF KEYING

*T—550-volt b.c.-type transformer having 1100-volt center-tapped high-voltage secondary and two 7.5-volt filament windings*
*$C_8$—0.005 μfd.*
*$C_9$, $C_{10}$—3 μfd. 500-volt*
*Ch—30-henry (commercial rating) 100-ma. filter choke*
*$R_3$—50-ohm, 200-ma. rheostat*
*$R_4$—3500 ohms, 10 watt*
*$R_5$—15,000-ohm 50-watt voltage divider*
*$R_6$, $R_7$—2-ohm adjustable resistors set to drop voltage to correct value for 5Z3 and 807*

can be done by setting $C_2$ at some value and then tuning the antenna and plate circuits for maximum stable power output. Care must be used not to feed too much power into the crystal circuit, however, or else!

For those interested, Fig. 2 shows the antenna coupling and tuning circuit. No points of special interest were noted. Small diameter coils of this

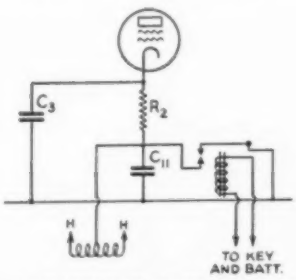



FIG. 4—CATHODE KEYING CIRCUIT

*Values correspond to those previously given except for $C_{11}$, which is 0.01 μfd. $R_3$ may be placed in series with relay contacts to improve key-click elimination.*

type have to be placed quite close together for good coupling, present value being about ½ inch on either end.

Fig. 3 shows the power supply with an early keying arrangement. At this time, the keying relay, a rewound auto generator cut-out, was connected immediately beyond the high voltage center tap. With this connection, and the simple (and temporary) key click filter shown, very good reports were obtained. The rheostat used must be large enough to carry the entire load current. Naturally, the value of the rheostat and condenser will vary with individual conditions. Later, cathode keying was tried as shown in Fig. 4 and was also found to be very satisfactory. The b.c. receiver in the next room doesn't hear a single click. In both cases, the relay worked much better when placed at the actual point of breaking the circuit. When a long lead was used to the relay, the r.f. circuit became balky and unsatisfactory. Cathode keying is probably best for quick and successful operation. How-

*(Continued on page 42)*

## Henry B. Joy

### W8IA-W8IO-W1AHM

HENRY B. JOY, 71, W8IA-W8IO-W1AHM, one of the founders and past-president of the Packard Motor Corp., died of heart disease on November 6th at his home on Grosse Pointe Farms, Michigan.

Characterized by the *Detroit News* as "capitalist, industrialist and outstanding citizen," by the *Free Press* as "business executive, banker, automobile pioneer, soldier, patriot," Mr. Joy was one of the foremost figures in the automotive world from that day just at the turn of the century when he founded the Ohio Automobile Co. (incorporated in 1902 in Detroit as Packard) until his death, when Henry Ford and other leading men in the industry served as honorary pallbearers.

Well known also was he for his amateur radio activities, in which he was almost equally a pioneer. His stations at his home, on his farm near Selfridge Field, and, at one time, on his yacht, were consistently on the air, with either Mr. Joy himself or Arthur Grolz, W8DK, at the key or microphone. One of his conversational habits was the narration of anecdotes derived from his ham operating experiences. His mechanical bent caused him to do much of the constructional work at his stations with his own hands.

Henry B. Joy was perhaps amateur radio's most prominent recruit from the world of industry and finance, and one of its best friends. We can be proud and grateful that the record of his life is embellished with his work in our cause. Jointly with W8DK we say, "His key is silent, but the spark of his memory will live on forever."

# What the League Is Doing

## League Activities, Washington Notes, Board Actions—For Your Information

***Examination Schedule*** The F.C.C. announces its schedule of amateur examinations for 1937. Consult the following list when you need to know when and where examinations will be held. Where exact dates or places are not shown, information may be obtained, as the date approaches, from the Inspector-in-Charge of the district. It should be noted that *no examinations are given on national holidays* or state holidays.

DISTRICT NO. 1

Boston, Mass., 7th Floor, Customhouse, every week day except Thursday.

DISTRICT NO. 2

New York City, 1024 Federal Bldg., 641 Washington St.; Tuesdays, Thursdays and Saturdays.
Schenectady, N. Y., some time in March, June, September and December.

DISTRICT NO. 3

Philadelphia, 1200 Customhouse, 2nd and Chestnut Sts.; every Wednesday.

DISTRICT NO. 4

Baltimore, Fort McHenry; Wednesdays and Saturdays.

DISTRICT NO. 5

Norfolk, Va., 402 New Postoffice Bldg.; every Friday.
Winston-Salem, N. C., February 6th, May 8th, August 7th, November 6th.

DISTRICT NO. 6

Atlanta, 411 Federal Annex; Tuesdays and Fridays.
Nashville, Tenn., February 19th, May 21st, August 20th, November 19th.

DISTRICT NO. 7

Miami, 12 New Federal Bldg.; each Monday and Friday by appointment.
Jacksonville, June 4th and November 5th.

DISTRICT NO. 8

New Orleans, 326 Customhouse; every Monday; other days by appointment.
Little Rock, Ark., April 13th and September 14th.

DISTRICT NO. 9

Galveston, Texas, 209 Prudential Bldg.; by appointment only.

DISTRICT NO. 10

Dallas, 464 Federal Bldg.; every Tuesday.
Oklahoma City, February 19th and 20th, May 21st and 22nd, August 20th and 21st, November 19th and 20th.
San Antonio, March 12th and 13th, June 11th and 12th, September 10th and 11th, December 10th and 11th.
Albuquerque, N. M., May 1st, November 1st.

DISTRICT NO. 11

Los Angeles, 1105 Rives-Strong Bldg.; Mondays and Saturdays.
Phoenix, Ariz., some time in April and in October.

DISTRICT NO. 12

San Francisco, 328 Customhouse; Class A, daily; Class B, Mondays.

DISTRICT NO. 13

Portland, Ore., 207 New U. S. Courthouse; every Friday.
Boise, Idaho, some time in April and in October.

DISTRICT NO. 14

Seattle, 808 Federal Office Bldg.; every Friday.
Butte, Mont., some time in May and in November.
Spokane, Wash., some time in May and in November.

DISTRICT NO. 15

Denver, 538 Customhouse; first and third Saturdays of each month.
Salt Lake City, some time in March and in September.
Billings, Mont., some time in April and in October.

DISTRICT NO. 16

St. Paul, Minn., 927 Main P. O. Bldg.; first Saturday of each month.
Bismarck, N. D., some time in April and in October.

DISTRICT NO. 17

Kansas City, Mo., 410 Federal Bldg., first and third Saturdays of each month.
Des Moines, January 8th and 9th, April 9th and 10th, July 9th and 10th, October 8th and 9th.
St. Louis, February 12th and 13th, May 14th and 15th, August 13th and 14th, November 12th and 13th.

DISTRICT NO. 18

Chicago, 2022 Engineering Bldg.; every Saturday.

DISTRICT NO. 19

Detroit, 1025 New Federal Bldg.; every Saturday.
Cleveland, some time in January, April, July and October.
Cincinnati, some time in February, May, August and November.
Columbus, Ohio, some time in March, June, September and December.

DISTRICT NO. 20

Buffalo, 514 Federal Bldg.; first Friday of each month, and other days by appointment.
Pittsburgh, some time in March, June, September and December.

DISTRICT NO. 21

Honolulu, Aloha Tower; Mondays and Saturdays.
Some time in the month of July, amateur examinations will be held at Hilo; Wailuku, Maui; Lanai City, Lanai; Kaunakakai, Molokai; and Lihue, Kauai; also additionally at Hilo in December.

HEADQUARTERS

Washington, D. C., F.C.C. offices; every Thursday.

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***Financial Statement*** The routine operations of the League showed a gain, for the third quarter of the year, of $1590.92 before expenditures against appropriations. This is perhaps a little better than normal for that season of the year, the low period in income. The first and last quarters of the year are the big ones from the standpoint of business affairs in A.R.R.L. For the information of mem-

bers, and at the instructions of the Board of Directors, the operating statement for the third quarter is here printed:

STATEMENT OF REVENUE AND EXPENSES, EXCLUSIVE OF EXPENDITURES CHARGED TO APPROPRIATIONS, FOR THE THREE MONTHS ENDED SEPTEMBER 30, 1936

| | | |
|---|---|---|
| **Revenues** | | |
| Membership dues | $12,525.02 | |
| Advertising sales, *QST* | 20,521.54 | |
| Newsdealer sales, *QST* | 11,225.32 | |
| Handbook sales | 6,357.48 | |
| Booklet sales | 1,922.88 | |
| Calculator sales | 553.97 | |
| Membership supplies sales | 2,112.54 | |
| Interest earned | 769.71 | |
| Cash discounts received | 196.32 | |
| Bad debts recovered | 6.00 | |
| | | $56,190.78 |
| *Deduct:* | | |
| Returns and allowances | $ 3,444.70 | |
| Increase in provision for newsdealer returns of *QST* | 161.30 | |
| Collection and exchange | 9.90 | |
| Cash discounts allowed | 321.38 | 3,937.28 |
| Net Revenues | | $52,253.50 |
| **Expenses** | | |
| Publication expenses, *QST* | $14,023.04 | |
| Publication expenses, Handbook | 3,967.40 | |
| Publication expenses, booklets | 583.66 | |
| Publication expenses, calculators | 319.54 | |
| Salaries | 21,980.07 | |
| Membership supplies expenses | 1,114.42 | |
| Postage | 1,791.47 | |
| Office supplies and printing | 1,280.88 | |
| Traveling expenses | 1,538.49 | |
| *QST* forwarding expenses | 739.40 | |
| Telephone and telegraph | 542.18 | |
| General expenses | 731.14 | |
| Insurance | 137.04 | |
| Rent, light and heat | 805.40 | |
| Provision for depreciation of furniture and equipment | 259.30 | |
| General Counsel expenses | 435.53 | |
| Communications Dept. field expenses | 93.93 | |
| Headquarters Station expenses | 19.91 | |
| Bad debts written off | 299.78 | |
| Total Expenses | | 50,622.58 |
| Net Gain before Expenditures against Appropriations | | $ 1,590.92 |

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***Cairo Notes*** Readers of *QST* are aware that when the Allocations Committee of the group preparing the United States proposals for the Cairo Conference rejected the A.R.R.L.'s request for an increase in amateur frequencies, the League filed a minority report with the main committee, which similarly rejected it by a vote unanimous except for our voice. The League then took an appeal to the Federal Communications Commission, which had the duty of reviewing the work of the committees and transmitting the recommendations to the Department of State. The F.C.C. also rejected our appeal and transmitted the report of the committees without recommendation for an increase in amateur frequencies. We have now to report that the League has taken a final appeal to the Department of State itself, asking for a review and further consideration of our case. This is now pending, the results not yet known.

Meanwhile we have word from Canada that the Dominion government has rebuffed a similar request for an increase in the amateur bands filed by Canadian General Manager Reid and recently reported in this department. While the Canadian government will not support an increase in amateur frequencies, it undertakes to support rigidly the present bands and will also oppose any change in our u.h.f. bands above 28 Mc.

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***Washington Notes*** All of U. S. amateur radio is now operating under three-year card licenses. The total of valid station licenses on September 30th last was 47,063, a slight gain over the figure of 46,850 at the close of the fiscal year, June 30th. The number of valid operator licenses closely approaches the figure for stations, on September 30th being approximately 46,300.

Everyone is awaiting the pronouncement of the F.C.C. concerning the allocation of frequencies above 30 Mc., and it is expected that there will be some news soon. Our stake in the matter relates particularly to our desire for a 112-Mc. band exclusively for amateurs, and our interest in the protection of our 56-60-Mc. band. The Commission also has under consideration a revision of the relations governing portable operation by amateur stations, and some clarification of these rules is to be expected in the near future.

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## Silent Keys

It is with deep regret that we record the passing of these amateurs:

William E. Brentlinger, W9NTP, Terre Haute, Ind.
Harold E. Cherry, W8GDE, Galion, Ohio.
Guy M. Ferguson, W2BJA, Albany, N. Y.
George L. Hax, Jr., W9OLG, Kansas City, Mo.
Ralph Ingalls, W7CAT, Payette, Idaho.
Louis R. Isaacs, W6CAD, Alameda, Calif.
Dr. E. C. Jenkins, W5EYQ, Rotan, Texas.
Horace Howard Johnson, W7EUR, Rogue River, Ore.
N. R. Jewell, W8ITO, St. Joseph, Mich.
Henry B. Joy, W8IA-W8IO, Grosse Pointe Farms, Mich.
Cecil H. Twohig, W2DTA, Woodside, N. Y.

# A 913 Oscilloscope With Linear Sweep

## The New Miniature Cathode-Ray Tube in an Inexpensive Unit for General Amateur Use

By J. B. Carter*

THE announcement of the new low-priced 913 cathode-ray tube [1], together with standard economical associated components, has at last placed a most valuable analytical tool within the reach of many amateurs who have heretofore lacked the necessary wherewithal for the larger type oscilloscopes. The oscilloscope unit to be described here is similar to many commercial units using the larger tubes with the exception of the size of the fluorescent screen of the c.r. tube itself. Although the size of the screen of the 913 is approximately one inch, this does not detract from the usefulness of this tube for amateur applications.

As many amateurs will be using the cathode ray tube for the first time, a brief résumé will be devoted to operation and interpretations of some of the more common wave patterns. While an article of this nature can only scratch the surface of this inexhaustible subject, the reader is urged to digest thoroughly the various references found in current handbooks and text books for a more comprehensive treatment.

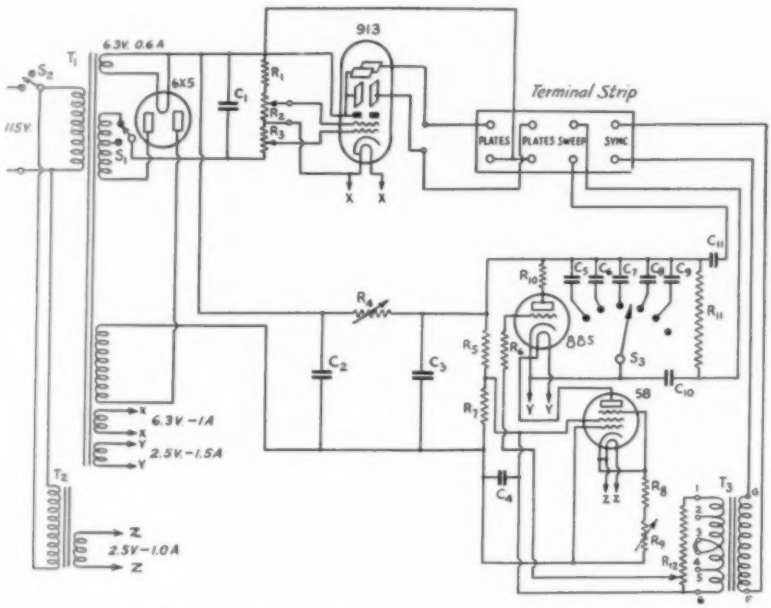



FIG. 1—COMPLETE CIRCUIT OF THE 913 OSCILLOSCOPE UNIT

$C_1$—1-μfd. 600-v. paper
$C_2$, $C_3$, $C_4$—8-μfd. 400-v. electrolytic
$C_5$—0.1-μfd. 400-v. paper
$C_6$—0.025-μfd. 400-v. paper
$C_7$—0.005-μfd. mica
$C_8$—0.001-μfd. mica
$C_9$—100-μμfd. mica
$C_{10}$, $C_{11}$—0.1-μfd. 400-v. paper
$R_1$—1-meg. 1-watt
$R_2$—500,000-ohm potentiometer (Electrad)
$R_3$—200,000-ohm potentiometer
$R_4$—50,000-ohm variable (Electrad)
$R_5$—30,000-ohm 1-watt
$R_6$—300,000-ohm ½-watt
$R_7$—5000-ohm 1-watt
$R_8$—1500-ohm ½-watt
$R_9$—50,000-ohm variable (Electrad)
$R_{10}$—1000-ohm 1-watt
$R_{11}$—10-meg. ½-watt
$R_{12}$—10,000-ohm potentiometer (Electrad)
$T_1$—Rectifier supply transformer (Kenyon T-207)
$T_2$—Filament transformer (Kenyon K-10)
$T_3$—Synchronizing voltage input transformer (Kenyon T-1)
$S_1$—S.p.d.t. toggle switch
$S_2$—S.p.s.t. toggle switch
$S_3$—Single-gang 6-point switch

The circuit diagram shown in Fig. 1 is entirely straightforward and is laid out for rack mounting. Since the space requirements for this unit are extremely small, no difficulty will be experienced

* Kenyon Transformer Co., 840 Barry St., New York, N. Y.

[1] Page 37, Dec. 1936 *QST*.

in adapting it in many instances to existing rack-and-panel transmitters with a minimum of trouble. The tubes used in this circuit, in addition to the 913, are a Type 6X5 rectifier tube, an 885 gas triode for the saw-tooth oscillator and a Type 58 pentode tube for the current-limiting device which maintains a constant charging current to the condenser. The inclusion of this tube provides exceptional sweep uniformity for output voltages up to approximately 80 per cent of the supply.

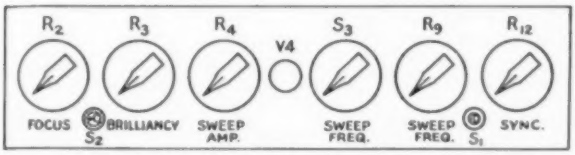
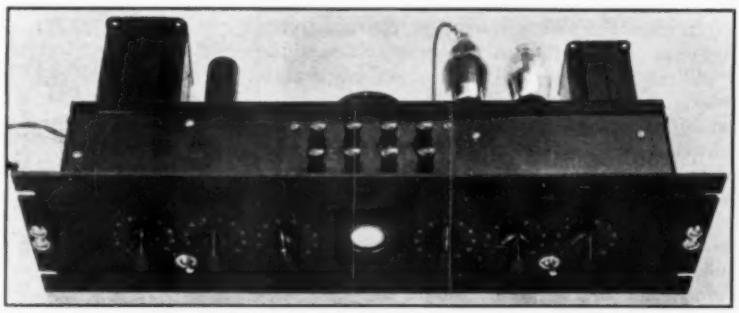



FIG. 2—CONTROL PANEL ARRANGEMENT OF THE OSCILLOSCOPE UNIT

The power supply includes a power transformer and a separate filament transformer. The filament transformer is optional. The 58 tube may be replaced by a 78 or 6K7 tube, and the filament operated from a six-volt storage battery or any isolated source of six volts, a.c. or d.c. The filament transformer is mounted inside the chassis below the power transformer. Only a single rectifier tube is used to supply both the 913 and sweep-circuit d.c. voltages, using the two halves of a full-wave 6X5 rectifier tube as separate half-wave rectifiers. This is a novel method of obtaining two separate rectifiers with a single tube. Filtering is accomplished by condensers alone, as shown in the diagram, since both the 913 and the sweep circuit have low-drain requirements and ripple is not important. The 913 bleeder and voltage-divider circuit is also entirely conventional. The tap changing switch, $S_1$, on the transformer allows changing the d.c. output to the 913 from 425 to 300 volts, allowing for more sensitive operation of the tube on the lower voltage, which is usually sufficient for good brilliancy of the image of the tube screen.

The sweep circuit is also entirely conventional except for slight changes which permit operation at a d.c. voltage of about 200 volts.



*THIS COMPLETE OSCILLOSCOPE UNIT CAN BE BUILT FOR ABOUT TWENTY DOLLARS*

***The various components visible are identified in the text.***

### MECHANICAL LAYOUT

In what follows, when we speak of left- and right-hand side of the chassis, it will be with the consideration that we view the apparatus from the panel side—that side which has the tube screen and controls on it—and that the bottom of the rack panel is that side with the switches, $S_1$ and $S_2$, on it. The apparatus is designed so that the power supply and sweep circuit arrangements are at opposite ends, to avoid stray pickup as much as possible, and thus minimize the necessity for shielding. The power supply circuit, with its two transformers and tube, is at the left. The sweep circuit, with its two tubes and synchronizing transformer, is at the right. The Type 6X5, 58 and 885 tubes are mounted in the conventional sub-panel manner, but the 913 cathode ray tube is mounted so that its screen comes flush with the panel front. This necessitates a large hole in the rear of the assembly to allow the tube socket to project behind. This permits mounting the socket on a disk of bakelite so that the tube may be rotated for obtaining alignment, horizontal and vertical. The layout of controls on the rack panel is as follows:

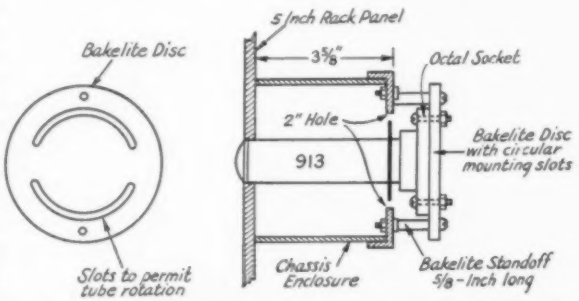



FIG. 3—MOUNTING FOR THE 913 CATHODE-RAY TUBE BEHIND THE PANEL

First, the accelerating voltage control $R_3$, then the biasing voltage control $R_2$. Between $R_2$ and $R_3$, and below them, is the a.c. line switch, $S_2$. Next in the lineup is the sweep amplitude control,

$R_4$, followed by the screen of the c.r. tube. On the right of the tube the first control is the sweep-frequency control switch, $S_3$. Next is the sweep-frequency resistance control, $R_9$. Between $R_9$ and $R_{12}$ is the transformer tap-switch $S_1$. $R_{12}$, the last control on the panel, is the synchronizing potentiometer.

The terminals for the deflecting plates, sweep output and synchronizing are brought out at the top of the chassis above the 913 tube. This arrangement of controls further minimizes the need for shielding; the experimental model shown was not shielded at all, and showed very little pick-up effect.

### METHOD OF OPERATION

To place the unit in operation, connect to the 115-volt 60-cycle line, and snap switch $S_2$ to the "on" position. Short both sets of deflecting plate terminals. By adjustment of $R_2$ and $R_3$, a small well-focused spot of sufficient brilliancy is easily obtained. Do not use too brilliant a spot and *do not allow a brilliant spot to remain stationary on the screen*, since this may cause permanent injury to the fluorescent material. When these operations have been completed, shut off the apparatus and connect the sweep circuit to one set of plates. The other set of plates should be shorted to avoid pickup. A line should now appear on the screen, but if it does not adjustment of $S_3$ and $R_9$ may be necessary to start the sweep circuit oscillating.

When the line appears, disconnect the sweep from these plates and connect it to the other set of plates. Short the unused set of plates. This will swing the line through 90°; observe on which set of plates the best deflection is obtained, and use

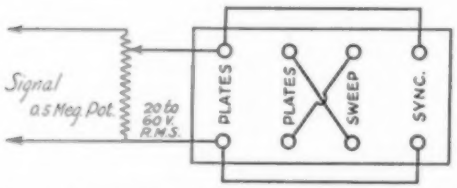



*FIG. 4—CONNECTIONS FOR OBSERVING AN AUDIO-FREQUENCY SIGNAL VOLTAGE*

this set of plates for the sweep circuit connection so as to obtain maximum sweep amplitude. A signal voltage for observation may now be connected to the other set of plates, after the short has been removed. It is well to note here that both sets of plates have a common connection and therefore it is a good idea to test for grounds before applying a signal. The terminal layout is shown in Fig. 1.

If the line of sweep on the fluorescent screen is not horizontal, rotating the tube socket of the 913 at the rear of the assembly (Fig. 3) will make it so.

### SIMPLE CIRCUITS FOR USING THE OSCILLOSCOPE

To observe an audio signal, connect the signal input to "plates," as shown in Fig. 4, through a

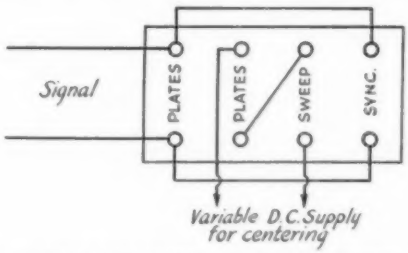



*FIG. 5—BIAS ARRANGEMENT FOR CENTERING PATTERN*

high-resistance potentiometer if it is necessary to reduce amplitude. Connect the "sweep" terminals to the other set of "plates." Adjust $R_2$ and $R_3$ for best focus. Adjust $S_3$ and $R_9$ until a stationary pattern is obtained on the screen. On $S_3$ the sweep-frequency range is from 5 cycles on Point 1 to 10,000 cycles on Point 5. Point 6 is used only for very high frequencies. Control $R_9$ gives fine adjustment of these steps. When a more or less

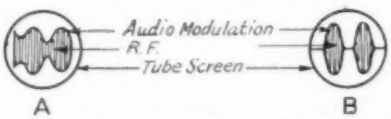



*FIG. 6—TYPICAL MODULATION PATTERNS WITH SYNCHRONIZED LINEAR SWEEP*

stationary pattern has been obtained, adjust $R_{12}$ until the pattern is locked (does not drift) by the synchronizing action. Should it be found that for some reason the pattern is off to one side of the vertical axis, the arrangement of Fig. 5 may be used to center it.

This circuit is also useful for determining percentage modulation by the modulated envelope method. The r.f. modulated signal is applied to plates as above, and the *audio* frequency signal is fixed by the sweep frequency. Thus a modulated pattern will appear as shown in Fig. 6. It is best to have a single-tone modulating signal. Example A illustrates about 30 per cent modulation, while example B illustrates about 150 per cent modulation (over-modulation).

The terminal connections for obtaining the familiar trapezoidal modulation pattern is as shown in Fig. 7. The pattern developed is as shown in Fig. 8. Pattern A shows under-modulation, while B shows over-modulation. In both cases the r.f. modulation envelope and the a.f. modulating voltage are in phase, which is a condition not always found in practice. A condition where they are out of phase and under-modulated is shown in C. The elliptical shape of top and bottom indicates the out-of-phase relation.

*(Continued on page 108)*

# How Would You Do It?

## Announcing a Monthly Practical Problem and Gadget Contest—With Prizes An' Everything

THE ham is an ingenious cuss by very nature. One can't visit any amateur station without finding evidence of clever improvisations either in the construction of individual components or in the manner in which the whole station is put together. Rarely do two amateurs solve the same problems in the same fashion. The solution is always a contribution of some worth to the amateur game at large.

The difficulty is that many of the gadgets, ideas and procedures are buried at the source. Only in rare cases do they benefit the game by being put into general circulation. This is the state of affairs which led us to plan a monthly contest in which some one practical problem is offered, the originators of the most useful and novel solutions being awarded prizes—the solutions themselves being given circulation in *QST*. Of course, the particular problem offered may or may not have been encountered in the experience of the contestant. This does not debar him from cranking up his think box and cooking up a proposed solution. Indeed, some of the problems will be so broad in scope (such as the planning of a station layout) that the solution will find no exact parallel in any amateur experience.

The purposes of the contest, then, are to give recognition and wider circulation to the ingenious ideas of practical, honest-to-goodness, operating amateurs; to disclose new and better ways of doing old jobs; lastly, to provide some interest and sport for those long evenings when one's favorite band is misbehaving.

Unfortunately, contests must have their rules. Here they are, in the simplest possible form:

1. Solutions must be mailed to reach West Hartford before the 20th of the publication month of the issue in which the problem has appeared. (For instance, solutions of problem given in the January issue must arrive at *QST* before January 20th.) They must be addressed to the Problem Contest Editor, *QST*, West Hartford, Conn.

2. Manuscripts must not be longer than 1000 words, written in ink or typewritten, with double spacing, on one side of the sheet. Diagrams and sketches may be in pencil, but must be neat and legible.

3. All solutions submitted become the property of *QST*, available for publication in the magazine.

4. The editors of *QST* will serve as judges. Their decision will be final.

Much as we should like to give a silver cup with platinum trimmings to the winners, we have decided to do the more practical thing of offering $5 worth of A.R.R.L. station supplies or publications to the author of the solution considered best each month, $2.50 worth of supplies to the author of the solution adjudged second best. The winners have the privilege, of course, of stating the supplies preferred.

### Problem No. 1

THE amateur owns a 200-watt c.w. and 'phone transmitter arranged in space so restricted that both the transmitter and receiver must be located quite close together and within a few feet of the antenna lead-in. As is usual in such instances, our operator has had frequent trouble from burned out first cathode resistors in the receiver and greatly reduced life of the first r.f. tube. Something must be done to protect the receiver during transmission. Some simple, inexpensive and practical method is required without the introduction of an extra switch to be thrown at each changeover. Already, our hero has installed a relay to throw the small directional antenna from transmitter to receiver. Also, he is in the habit of switching off the plate voltage of the receiver during transmission. He is willing to purchase an inexpensive relay of some kind (should that really solve his problem) but he would much prefer to build any necessary gadgets providing they do not demand more than the few simple tools available in his work-shop. The receiver is a well-known commercial product with the conventional low-impedance input. Our amateur is a little slow on the uptake—he insists on having a clear explanation and complete sketches of anything he hopes to assemble.

#### GET GOING

This contest is in the nature of an experiment. There is the probability that it will provide us all with a wealth of ideas and information. But it will do so only if you fellows are *actively* interested. Drop the idea that your solution can't possibly be as good as the other fellow's. It is almost certain to be better.

—*R. A. H.*

# Some Practical Inverse Feedback Circuits for Audio Power Amplifiers*

## Improved Output Voltage Regulation With Reduced Harmonic Distortion

WHEN power output and distortion characteristics of the final stage of an a.f. amplifier are to be determined, it is customary to replace the loudspeaker by a fixed resistance of suitable value. Actually, a loudspeaker does not present the same impedance to an output tube at all audio frequencies. At the resonant frequency of the speaker, which is usually less than 100 cycles, the impedance of the speaker is high and resistive. At higher frequencies, the impedance of the speaker increases with frequency, because the voice coil has inductive reactance. Unless the variable effects of such a load are reduced by a low-resistance output tube, low frequencies "hang-over" and are accentuated by resonance effects in the speaker; high frequencies are accentuated by the rising impedance characteristic of the speaker.

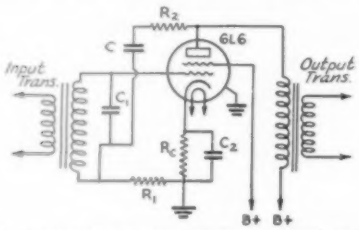



*FIG. 1—SINGLE-TUBE INVERSE FEEDBACK CIRCUIT*

*C—0.1 μfd. or larger.*
*$C_1$—0.001 to 0.002 μfd.*
*$C_2$—Cathode-resistor by-pass condenser.*
*$R_c$—Cathode resistor.*
*$R_1$—5000 ohms for 10% inverse feedback.*
*8330 ohms for 16.6% inverse feedback.*
*$R_2$—45,000 ohms for 10% inverse feedback.*
*41,670 ohms for 16.6% inverse feedback.*

The internal resistance $r_p$ of an output tube shunts the plate load $Z_1$. When $r_p$ is appreciably less than $Z_1$, large variations in load impedance do not appreciably affect the output voltage, because the variable load impedance is shunted by the comparatively low resistance of the output tube. Hence, when a low-impedance triode is used in the output stage, the effects of the variable speaker impedance are reduced. When the internal resistance of the output tube is high compared to the load impedance, the effects of variable speaker impedance may seriously impair quality. This latter condition exists when tetrode- or pentode-type output tubes are used without compensating circuits.

Inverse feedback circuits can be used in a.f. power amplifiers to decrease distortion and to lower the plate impedance (improve the output voltage regulation). The circuits of a practical single-tube and of a push-pull amplifier using partial inverse feedback are shown in Figs. 1 and 2, respectively. Resistors $R_1$ and $R_2$, and condenser $C$ are connected in series; the combination is connected from the plate of each tube to ground. Nearly all the a.c. voltage developed across the load appears across $R_1$ and $R_2$ when the capacitance of $C$ is high. Of this voltage, that due to $R_1/(R_1 + R_2)$ is applied in series with the input-signal voltage; this ratio is defined as the per cent degeneration, $n$. With any per cent degeneration, the tube acts as though its normal internal resistance $r_p$ were shunted by a resistance $1/(n\ g_m)$, where $g_m$ is the transconductance of the tube. The input signal required for rated output is approximately

$$E_d = E_o \left(1 + \frac{n\ g_m\ R_1}{1 + R_1/r_p}\right),$$

where $E_o$ is the input signal required for rated output without inverse feedback. The distortion with inverse feedback is approximately

$$D_d = \frac{D_o}{1 + \dfrac{n\ g_m\ R_1}{1 + R_1/r_p}},$$

where $D_o$ is the distortion without inverse feedback. The transconductance of the tube is not changed by the addition of this type of degeneration.

The cathode resistor, $R_c$, has the same value with and without inverse feedback, because electrode voltages are not changed when this circuit is used. Also, the load impedance into which the tube operates should not be changed when inverse feedback is added. The load resistance that is optimum without degeneration is also optimum with degeneration. Therefore, in order to use inverse feedback in some receivers, it may be necessary only to install $R_1$, $R_2$, and $C$.

### CIRCUIT PRECAUTIONS

Although the inverse-feedback circuits of Figs. 1 and 2 offer certain advantages, the following precautions should be observed in the design and use of these circuits in order to avoid the possibility of instability, oscillation, or a marked divergence from expected results.

*From Application Note No. 64, RCA Radiotron Division, RCA Mfg. Co., Inc. (Aug. 26, 1936).

1. A conventional resistance-coupled input circuit cannot be used with this type of degenerative circuit, because the input-signal voltage must be in series with the feedback voltage for proper operation.

2. It may be desirable to connect small fixed condensers, $C_1$, across each secondary of the input transformer in order to avoid the possibility of oscillation due to leakage inductance and shunt capacitance in the input-transformer circuit. It is advisable to determine by test whether or not these condensers are necessary.

3. The blocking condensers ($C$ in Figs. 1 and 2) should be placed between $R_1$ and $R_2$, as shown. When placed between $R_2$ and plate, the circuit may oscillate because of the capacitance of $C$ to grid.

4. It might appear that the primary of the output transformer could be tapped at the proper point or that a tertiary winding could be used to obtain the necessary feedback voltage. Attempts to use such schemes may be unsuccessful because of phase shifts due to leakage inductance.

5. This type of circuit is not suitable for use in amplifiers that are designed for grid-current operation, because the relatively high values of $R_1$ cause appreciable grid-circuit distortion.

### RESULTS OF OPERATING TESTS

Inverse feedback reduces the power sensitivity of an amplifier. In circuits having this feature it is, therefore, desirable to use an output tube that has high power sensitivity in order to obtain normal power output with reasonable signal voltage. For this reason, the 6L6 tube is well suited for use in this type of circuit. Preliminary tests indicate that the shunting effect on a speaker load by two type 6L6 tubes with 10 per cent degeneration is comparable to that which can be obtained by two low-resistance triodes in a similar circuit without degeneration. At the same time, the power sensitivity of the 6L6 amplifier is approximately twice that of the triode amplifier and the inherently high efficiency of the Type 6L6 tube is retained. In one test, a push-pull amplifier using two Type 6L6 tubes without degeneration was set up under the following typical operating conditions:

Plate voltage, 400 volts; screen voltage, 300 volts; grid bias, − 25 volts; plate-to-plate load, 6600 ohms.

With a peak grid-to-grid signal of 50 volts, the power output was approximately 34 watts at 2 per cent distortion. When 10 per cent degeneration was added, using the circuit of Fig. 2, an output of 34 watts was obtained from the tubes at the grid-current point with approximately 1 per cent distortion; grid current flowed with a peak grid-to-grid signal of 130 volts. No changes were made in electrode voltages or circuit constants.

The frequency characteristics of a typical amplifier with and without inverse feedback and with several values of shunt condensers for the same signal input indicate that the rise in power output at the resonant frequency of the speaker decreases and the high-frequency response flattens considerably when this form of degeneration is used. The effect of the shunt condensers, $C_1$, on frequency response is small, as the secondaries of the input transformer have low impedance.

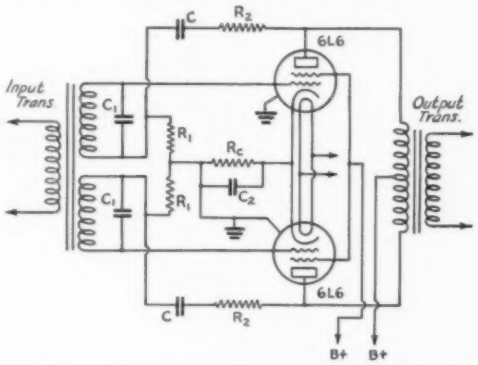



FIG. 2—PUSH-PULL STAGE WITH INVERSE FEEDBACK

*Capacitance and resistance values are the same as in Fig. 1.*

Oscillograms indicate the damping action of an inverse-feedback circuit when a short-impulse signal is fed to the grids of a push-pull amplifier and the output tubes are connected to a loudspeaker through an output transformer; the voice coil of the speaker is connected to a cathode-ray oscilloscope in order to observe the wave form of the voice-coil voltage. A slowly decaying output voltage results without degeneration while a more rapid decay is obtained with 10 per cent degeneration. A slight further improvement is obtained by using 16.6 per cent degeneration.

These studies show that nearly the same amount of damping of a speaker load can be obtained from Type 6L6 tubes with 10 per cent degeneration as from good low-impedance triodes without degeneration. However, for approximately the same input-signal voltage and B-supply power, about twice the power output can be obtained from two 6L6 tubes as from two good triodes.

## Strays

### Corrections

In the diagram of the NC-100 receiver, Fig. 1, page 31, December *QST*, condenser $C_{22}$, the heater by-pass on the high-frequency oscillator, should be returned to ground instead of to the cathode.

In Part II of W2BRO's article on the 6E5, November *QST*, the formula on page 26 should be

$$R_x = \frac{E_x R_b}{E_b}$$

# August '36 Field Day

THE special August 1936 A.R.R.L. Field Day, held following insistent demands of participants in the June affair for "a second '36 F.D.," met with much enthusiasm. Numerous clubs and other groups, as well as many individuals, took advantage of the opportunity to combine the fun of real outdoor radio activity with the more serious problem of testing portable/emergency equipment. The set-ups ranged from high-and medium-powered transmitters, getting their juice from rugged portable power plants, to single-tube rigs powered from hand-driven generators or "B" batteries.

*OPERATING POSITION INSIDE THE TENT AT W4CDC-4*

*The Chattanooga Amateur Radio Club takes its portable-emergency work seriously and tested in the Field Day a rugged outfit suitable for severe service in real emergencies.*

Scoring was the same as in the June doings, each contact counting one point, the total number of points being multiplied by 2 or 3, depending on whether either or both transmitter and receiver were independent of commercial power sources. Another multiplier of 3, 2, or 1 applied for plate powers falling between 0-20, 20-60, and 60-1000 watts respectively. The majority of participants operated in the lowest power classification and very few depended on commercial mains for power.

The two leading clubs in the June F.D. were reversed in order in August, the Northern Nassau Wireless Association taking first place with 1224 points. These chaps again operated from Poundridge Reservation, near Cross River, Westchester County, New York. All power was obtained from a gasoline generator, and the input to the final stage on all bands used (28, 14, 7 and 3.5 Mc.) was 18 watts. 136 contacts were rolled up by bands as follows: 57 on 3.5; 52 on 7; 26 on 14; 1 on 28.

Bowing to the N.N.W.A. group, the York Road Radio Club placed second with a score of 1152 . . . 128 QSO's. Apparatus was the same as used in June, transmitter employing a '47 oscillator and '46 amplifier. A different location was tried, however, Baederwood Park, Abington, Pa.

The Hamilton Amateur Radio Club crew, operating under the call VE3KM three miles north of Waterdown, Ontario, managed to make third place in spite of a series of storms which "put the wet blanket on the whole works." The lads picked quite an appropriate QTH because the "Water" sure did come "down"! Operation was on 7 and 3.5 Mc., the latter coming in for most of the work. The outfit used a '47-RK25. Twelve 6-volt batteries kept the 12-volt to 500-volt genemotor running.

The South Hills Brass Pounders and Modulators (W8CKO-8) was second in number of QSO's—132—and fourth in standing among clubs. Clattys Driving Range, Mt. Lebanon, one of the highest points in Allegheny County, Pa., was chosen for the portable location. The transmitter used a 53 crystal oscillator, 841 buffer. 803 final running at 55 watts. 130 contacts were made on 7 Mc. with this rig, 2 contacts on 56 Mc. with a transceiver. Among the eight operators at W8CKO-8, W8QAN made 57 of the contacts. In the June F.D. the S.H.B.P. & M. made about 60 contacts, 10 of which were on 56 Mc.

*W4DVK, W4PL, W4DUS, W5CPX AND W4DIJ, THE "NIGHT SHIFT" AT W4CDC-4, PORTABLE STATION OF THE CHATTANOOGA (TENN.) AMATEUR RADIO CLUB LOCATED ON THE FARM OF W4PL*

Leading the non-club groups come W11GK and W11QZ, operating W11GK-1 set up in a tent in the Maine woods. The tent was made of an old mainsail from a sloop, and in spite of a drizzling rain they succeeded in keeping dry. 67 different

stations were worked, the bulk of operation being on 3.5 and 7 Mc. with one contact thrown in on 14 Mc. The transmitter was a single "ten" in TNT circuit; filament lighted from 6-volt battery, plate power furnished by a Genemotor, 30 ma. at 250 volts, or 7.5 watts. Receiver was a 57-56 combination using 180 volts of B batteries and 6-volt battery for the filaments.

The highest single operator score is that of W8IFD, who operated portable at the Kalamazoo Y.M.C.A. camp, about 140 miles north of Kalamazoo and 15 miles east of Hart, Mich. All work was on a single frequency—3824 kc. 54 stations were QSOed for 486 points. P.P. 6A6 crystal oscillator pushing P.P. 6A6 final amplifier constituted the transmitter. Plate supply was a 300-volt Genemotor running from a 6-volt storage battery. Filament supply also came from a storage battery. Input to the final was 19.5 watts. A t.r.f. receiver was used with 78-77-37 combination. 135 volts of "B" batteries supplied the plate juice, storage battery lighted the filaments. Two handicaps noted by W8IFD were "electrical storms and lack of crystals for both ends of the band."

During the June Field Day the Chattanooga Amateur Radio Club was on with a low- to medium-power outfit, 50 watts input to a '10 final. For the August event the gang decided to use just as powerful an outfit as could reasonably be called portable, an outfit such as might be needed in event of a real emergency. The photographs herewith show the results of the "Chattanooga" efforts in preparing a "heavy duty" set-up. The emergency power supply consisted of a Delco engine with a built in 1¼-kw. 110-volt d.c. generator on the same shaft as the flywheel. The d.c. output from this went to the motor generator. Two field rheostats gave control over the a.c. output, while varying the speed of the engine varied the frequency. By juggling all three they were able to get very steady 60-cycle, 115-volt a.c. at the station, located some 100 yards away. The receiver was a ham-built super, described in April 1936 *QST*. The transmitter was a standard rack job using 53 crystal-'10-P.P. 50-T's final, run at 175/200 watts during the F.D. Electric light was available while the engine was running, a flashlight to refill the tank with, and a gasoline lantern (note it in the photo) "just in case . . ." As for results: Operating under as nearly as possible the same conditions as in June, about 35% more stations were worked, with uniformly better reports. Much can be said in favor of "high-powered emergency outfits," even though the "transportation" problem becomes more severe. In a real emergency it is usually possible to secure a truck or other means of transportation, and the additional power is usually most welcome under trying conditions.

**W9CJC-9 IN ACTION**

***This set-up was manned by members of the Black Hills Amateur Radio Club of Rapid City, South Dakota.***

**THE MONCTON (N. B.) AMATEUR RADIO CLUB GANG PICKED A WIDE-OPEN SPOT FOR THE FIELD DAY ACTIVITIES**

***Several of the crew are pictured, left to right: VE1DC, VE1EV, VE1GI, VE1CX, VE1IJ.***

The Black Hills Amateur Radio Club set up W9CJC-9 in a cornfield east of Rapid City, So. Dak., including portable camping equipment and a gasoline power plant. 14-Mc. 'phone and 7-Mc. c.w. were used. . . . W9AWC-9 was operated by the Sedalia (Mo.) Amateur Radio Club in a cabin 40 miles from Sedalia, 6 miles from the nearest power line. A hand-driven generator powered the 3.5-Mc. set, a 12- to 750-volt d.c. motor generator ran the 7-Mc. rig. Filaments and the receiver were operated from storage batteries. . . . A 6L6 crystal oscillator with 400 volts of "B" batteries was used by W6JRZ-6 on 3.5 and 7 Mc. on Mt. Wilson. A 56-Mc. transceiver took care of operating on "5." . . . The W4NC (Winston-Salem A.R.C.) gang set up on the Yadkin River, about 20 miles from Winston-Salem, at a welcome spring. Power supply was an Austin motor pulling a 5-kw. generator, which furnished power and lights. . . . The Amateur Transmitters Association of W. Pa. operated under the call W8CUG-8, making the affair a general club outing. Transmitter was a c.c. 59 driving a '45 on 3.5 Mc. Receiver was an SW3 using battery supply. The transmitter power plant consisted of a small marine gasoline engine driving a 110-volt a.c. generator. Another generator, also driven with the gas engine, furnished lights, and kept the filament and excitation battery charged. Location was atop a hill out in the country back of Emsworth, Pa. . . . The Moncton Amateur Radio Club operated portable VE1DC on the shore of the Northumberland Straights at the mouth of Buctonche Bay, 35 miles northeast of Moncton (see photo). 'Phone and c.w. was used with an input of 40 watts on 3.5, 7 and 14 Mc. Seven operators worked in shifts through Saturday evening and night, and Sunday. Weather: damp—rain all day Sunday. . . . W6MGJ-6 of the Helix Amateur Radio Club used a 6A6 osc.-6A6 buffer-'10 final with 60 watts input. Power supply was ½-h.p. Briggs and Stratton gas engine driving a 500-volt generator and a low-voltage battery charging gen-

erator. "B" batteries were used on the receiver. . . . Says VE4PQ, Secretary of the Saskatoon Amateur Radio Club, "We feel that after the experience gained in the past couple of Field Days, we should be capable of handling any emergency." . . . W4CFD, W4AGI and W4AAR, representing the Southside Amateur Radio Club of Atlanta, Ga., took portable equipment to Jackson's Lake, some 50 miles southeast of Atlanta, and there operated W4CFD-4. Transmitter was a single 6A6 in an oscillator-doubler circuit working on 14, 7 and 3.5 Mc., powered by a Genemotor giving 180 volts at 50 mills. . . . The 13 operators and "generator engineers" at W9FI-9 (West Towns Amateur Radio Club of Maywood, Ill.) had a big time in spite of a 900-cycle generator whine in their battery receiver preventing accumulation of a large score. . . . After much scouting around town to gather the necessary gear, the Chester Radio Club delegation (W3BKQ-3) set up at Kaoli Lake, about ten miles from Chester, Pa. They used a 6L6 crystal oscillator with 12½ watts input, 6-volt battery for filament, dynamotor for plate supply. . . .

450 volts of "B" batteries supplied the plate supply for an 802 Tri-tet used on 7110 kc. by the W9VTO-9 gang at Detweiller Park, about five miles from Peoria, Ill. . . . W6GCM-6 was manned by W6MNR and W6GCM (Plantz and Bush), and they say, "We are not as green as our names!" On 3.5 Mc. they used a 6L6 c.c., and on 7 Mc. an '01A Hartley. . . . W6MVK worked the most stations of those in the single-operator group—total of 64. He used a portable transmitter, built for medium-power QRR work, self-contained in a steel case. . . . From W4RO-4: "This was our first F.D. participation, but it won't be the last . . . I know we are not up with the winners in points made, but we are close to the top in the amount of pleasure we got out of it . . . and, too, we learned a lot about what it takes to put a rig in the field and make it earn its cakes." The highlight for the 4RO gang was working K6 and K7 with the portable layout. . . . W8FNN-8 used 1.75- and 3.9-Mc. 'phone and 7-Mc. c.w., with best results on 3.9 Mc. Transmitter was 53 oscillator, two '45's par., modulated by pair of 2A3's, crystal mike. . . . "Thunderstorms soaked me completely, QRN kept me down, lightning so severe nothing doing even on 56 Mc. Sat. night; set up twice, but storms took me back under cover"—such is the sad story of W2QY. . . . W3BZE-3 was operated at Boy Scout Camp, Chesterfield Courthouse, Va., by W3BZE and W3EVN. Rig was an '01A TNT with 8 watts from 250-volt m.g. Receiver: 78-76, battery-powered. . . . The six operators at W9AIW-9 worked 64 stations using two complete crystal-controlled rigs (one each for 14 and 7 Mc.) with a 50-watter in the final of each. . . . VE2LC used a vibrator and storage battery to obtain power to run his 42 crystal oscillator; receiver was 78-76. . . . VE3BY and VE3AJB operated VE3BY's regular portable, a single 42 crystal oscillator, powered by a Philco vibrator and 180 volts of dry batteries—receiver was a 6C6-76 outfit in the same box as the transmitter. Operation was at Woodridge, on the Ottawa River. . . . The VE2BK gang got all set up on a mountain in northern Quebec and ready to go when, a half hour later, it started to rain! But a good time was had in spite of the moisture. . . . The set-up at W2HLB-2: Umbrella tent with a.c. equipment, card table and cot. Pup tent about 200 yards away on small open hill with 3.5-Mc. antenna to nearby woods, 6 "B" batteries, blankets on ground, battery-operated receiver and transmitter. Rain and QRN (lightning), hordes of spectators (little boys wanting to know all about crystal receivers). . . .

Field Days have taken a very definite place in amateur radio activities and thoughts are already turning to "the next." It is not too early to plan and build your portable/emergency outfit for the 1937 June F.D.

—*E. L. B.*

## AUGUST FIELD DAY SCORES

| Club Station | | QSO's | Score * |
|---|---|---|---|
| W2DXO-2 | Northern Nassau Wireless Association [1] | 136-A | 1224 |
| W3AJF/KF-3 | York Road Radio Club [2] | 128-A | 1152 |
| VE3KM | Hamilton Amateur Radio Club [3] | 68-A | 612 |
| W8CKO-8 | South Hills Brass Pounders and Modulators [4] | 132-AB | 538 t |
| W9CJC-9 | Black Hills Amateur Radio Club [5] | 55-B | 330 |
| W9AWC-9 | Sedalia Amateur Radio Club [6] | 49-AB | 306 |
| W4CDC-4 | Chattanooga Amateur Radio Club [7] | 99-C | 297 |
| W6JRZ-6 | Glendale Amateur Radio Club [8] | 27-A | 243 |
| W4NC-4 | Winston-Salem Amateur Radio Club [9] | 26-A | 234 |
| W8CUG-8 | Amateur Transmitters Association of W. Penna. [10] | 26-A | 234 |
| W4DJP-4 | Chattahoochee Amateur Radio Association [11] | 25-A | 225 |
| VE1DC | Moncton Amateur Radio Club [12] | 47-B | 188 T |
| W6MGJ-6 | Helix Amateur Radio Club [13] | 28-B | 168 |
| VE4AAA | Saskatoon Amateur Radio Club [14] | 18-A | 162 |
| W4CFD-4 | Southside Amateur Radio Club [15] | 17-A | 153 |
| W9FI-9 | West Towns Amateur Radio Club [16] | 9-A | 81 |
| W3BKQ-3 | Chester Radio Club [17] | 7-A | 63 |
| | INDIVIDUAL AND GROUP SCORES | | |
| W1IGK-1 | W1IGK-W1IQZ | 67-A | 603 |
| W8IFD-8 | W8IFD | 54-A | 486 |
| W9VTO-9 | W9VTO-W9VFI-W9IAG | 53-A | 477 |
| W4RO-4 | W4CWJ-W4CVB-W4RO-Ed Bettis | 67-B | 402 |
| W6MVK-6 | W6MVK | 64-B | 384 |
| W5FRC-5 | W5FRC | 43-B | 258 |
| W2DEN-2 | W2DEN-W2FQW-W2HGX | 28-A | 252 |
| W3BZE-3 | W3BZE-W3EVN | 24-A | 216 |
| W8FNN-8 | W8FNN-W8MDU-W8NQX-W8MQA-Andrew Tomek | 22-A | 198 |
| VE2BK | VE2KH-VE2JK-VE2BK | 18-A | 162 |
| W3EHW-3 | W3EHW-W3FQZ-W3GAC-W3FRB-W3EJB | 16-A | 144 |
| W8OFO-8 | W8OFO | 16-A | 144 |
| W6GCM-6 | W6GCM-W6MNR | 15-A | 135 |
| W1KBI-1 | W1KBI | 40-A | 120 RT |
| VE2LC | VE2LC | 13-A | 117 |
| W8DPY-8 | W8DPY | 11-A | 99 |
| VE3BY | VE3BY-VE3AJB | 9-A | 81 |
| W9AIW-9 | W9AIW-W9KGX-W9AOG-W9FNO-W9JPA-W9LPZ | 64-C | 64 RT |
| W1FGO-1 | W1FGO | 7-A | 63 |
| W2QY-2 | W2QY | 7-A | 63 |
| W9IPK-9 | W9OQW-W9GIZ-W9IPK | 7-A | 63 |
| W7RT-7 | W7RT | 6-A | 54 |
| W2HLB-2 | W2HLB-W2HYQ-W2IKR | 6-A | 48 RT |

* The "power classification" used in computing the score is indicated by A, B, or C after the number of QSOs shown. A indicates power up to and including 20 watts (multiplier of 3); B indicates power over 20 up to and including 60 watts (multiplier of 2); C indicates over 60 watts (multiplier of 1). More than one letter means that at different times different power inputs fell within different classifications. An R or T after the score indicates that receiver or transmitter were supplied from the public mains; no indication after scores where work was *entirely independent* of mains, r or t is used where only part of operation used mains supply.

Club operators: [1] W2AOL, W2ICO, W2GZS, W2DJO, W2DDU, W2HQJ, W2BWC, W2DUA, W2DXO, W2AYJ. [2] W3QV, W3AJF, W3BYS, W3AYH, W3CKS, W3CTB, W3DGC, W3DLH, W3DMF, W3EEW, W3EIC, W3EPC, W3ERF, W3ETM, W3EWO, W3FNN, W3FZQ, W3KF, W3PG, W3QS, Frank Hauler. [3] VE3KM, VE3GZ, VE3JL, VE3HT, VE3VZ, VE3DO, VE3VJ, VE3JU. [4] W8QAN, W8LCI, W8KUZ, W8OKF, W8OVT, W8EYZ, W8AIG, W8CKO. [5] W9ADJ, W9CJC, W9TOP, W9TZJ, W9YJX, W9UAV, Earl Shirly, M. J. Jones, Clifford Hall. [6] Operators names not reported. [7] W4PL, W4CBA, W4CDC, W4DVK, W4DUS, W5CPX, W4DIJ. [8] W6KBB, W6JRZ. [9] Operators names not reported. [10] W8CFR, W8BBV, W8QEL, W8MTK, W8NXD, W8BSO, W8KME, W8AVY, W8CUG, Sam Nickhasy. [11] W4CYC. [12] VE1DC, VE1EV, VE1GI, VE1CX, VE1IJ, VE1JU, VE1FF. [13] E. Harris, N. Balli, C. Boltz, J. A. Barnett, K. Hallett, R. Dobler, V. A. Milton. [14] VE4PQ, VE4QZ. [15] W4CFD, W4AGI, W4AAR. [16] W9FI, W9VH, W9AYE, W9KZV, W9MAH, W9SCH, W9VYQ, W9WHB, W9WUN, W9WUO, Charles Remus, Jim Johnson, Robert Syverson. [17] W3DGM, W3ATK, W3BIL, W3BFG, W3DRQ, W3CWQ, Duck Temple.

(*Continued on page 98*)

# What They Don't Know Won't Hurt 'Em

## A Tale of Woe

By J. L. Evans, Jr.,* W2BBK, W3BJN

ONE fine weekend during the summer I am out visiting my old sidekick, W3BXI. Now this particular period of days is the hottest which has ever hit the old Dutch town of Lancaster for many a moon, so that, after trying vainly to work anything but nines, we decide it would be a noble idea to depart in the general direction of downtown in search of a few cooling glasses.

In short, we are soon installed behind a weather-beaten table down in Louie's refreshment emporium, wondering whether it might not be a good idea to take up stamp collecting for the remainder of the summer months. This and other arguments contrive to absorb our attention until late in the evening when the crowd has begun to drop off and things are beginning to be a little quiet. Then, not wishing to be the cause of any overwork for poor tired Louie, we get up and kind of saunter over to the counter, where we can be served with less effort and a little more QRQ. It is while we are waiting for the seventh round that the whole thing starts.

We are in the middle of a discussion about 40 *vs.* 20 when the door opens slowly and a little woe-begone creature enters. Now this guy who comes in is indeed a pitiful figure. He is dressed in coat and trousers which don't match and which haven't seen the tailor's for at least a year come last Michelmas. A couple of forlorn buttons hang precariously from the coat by a few threads. He is unshaven and tattered, and his shirt—well, all in all, he's pretty much of a mess.

Now, his appearance alone is enough to attract attention. While the elite of local society do not frequent Louie's, still his clientele is fairly respectable, and their voices are hearty. But the thing which makes us notice this bird is that while he is standing waiting for his order, his fingers are busy tapping on the surface of the mahogany and they are tapping out what Lou and I are quick to recognize as nothing but the old favorite bromide, a "CQ DX."

Naturally enough this makes us very curious indeed, so that I presently turn to the stranger and say to him kindly, "Brother, are you a ham, too?"

With this, he turns around as if shot and his face lights up as if it was an '01A with a half-kw. input. "Pal," sezze, "did I hear you say you were a ham? What is going on in radio these days? How are the J's coming through on 20?"

So we tell him. And in no time at all we are back at our table in the corner and this weird specimen is pouring out his tale of woe in our large and sensitive ears.

"Friends," he sez, "once I was a happy man. I was married to a lovely creature, and my antenna was laying down an R9 sig down in the Aussie country. J's and ZT's floating through the air with the greatest of ease slid right down the doublet at old W3ZZZ.

"But the little woman didn't care for radio, and many and hot were the arguments which raged. Pretty soon I began to see that we were getting nowhere by arguing, so I said to myself, 'Homer, this is nothing to be doing.' Then I went into a huddle with myself and came out with the proper play." And with this he pulls his coat around him like, all of a sudden he was somebody again.

"Now, I decide to be clever. Every day I subtly slip the YF a little inside dope on radio, and in no time at all, I am beginning to get her interested. From there, it is only a step until she is learning the code, at which work she makes remarkable progress. One day the pride of my heart gets her license, and I think to myself, 'Ah, here is bliss indeed,' as she sits by my side as we work DX and chew the fat with the local boys.

"Now all this time the DX contest is approaching. So we polish up the haywire and raise the input to the 852's and everything is in fine shape to garner the certificate for the district. The day the contest does begin, I rush home early, to get in at the crack of the gun.

"But when I get there, wifey is already seated at the rig, and there is no supper on the table. The baby is howling for his bottle and there is a pile of dirty dishes in the sink. So I timidly walk up and remove one fone and whisper in her ear, 'Darling, how about some supper?'

"'Homer,' she replies tartly, 'if you do not quiet down I will miss this PY.'

"So all during the contest I eat in restaurants and hire a woman to watch the baby, meanwhile wondering if the little woman will find that XU I have been laying for on 14,328 kc. She does, and plenty more, so that it takes her an extra three days to compute the score.

"Now, that is only the beginning. She enters the Aussie-Zedder DX contest and the Sweepstakes and a couple dozen more things like that,

(*Continued on page 110*)

* 1026 S. 48th St., Philadelphia, Pa.

# A 50-Watt Rack-Mounted 'Phone Using Beam-Type Tubes

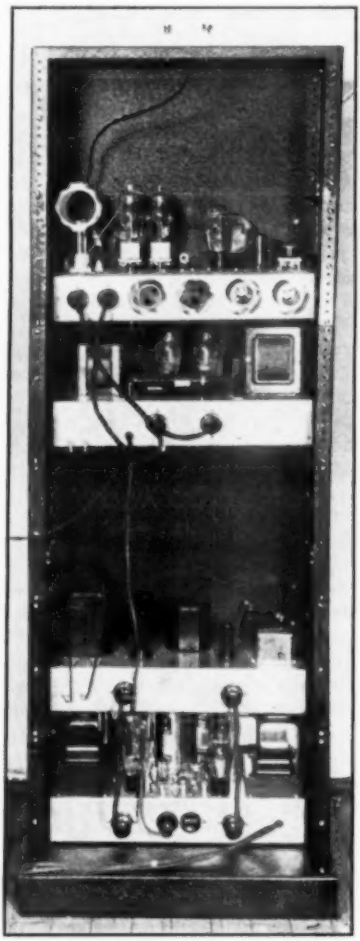
By R. E. Herbert,* W8NMY and Steve Tunder,** W8QCF

WITH the advent of the new audio-frequency beam power tubes there was immediate demand for a similar tube for radio-frequency applications. Some of us have spent many hours experimenting with the 6L6 tube for r.f., and have found in many instances that there were certain drawbacks to the metal type in r.f. circuits. Later the 6L6G tube was introduced, which helped the amateur, since it was less troublesome to neutralize, more stable and less critical of circuit conditions. However, to meet the strenuous requirements of the r.f. power service there have recently appeared the new 807 and RK-39, incorporating the up-to-date beam features of the 6L6. These tubes have a ceramic base and top-cap plate connection.

After experimenting with this new type it was found to work beyond our expectations, and the more we work with it the greater is our enthusiasm over it. The rig to be described uses a pair of parallel 807's in the final, modulated by a pair of

*FRONT VIEW OF THE TRANSMITTER*

*A pair of 807 beam-type tubes in the final stage is modulated by a pair of 6L6's Class-AB.*



*REAR VIEW OF THE TRANSMITTER SHOWING THE RACK ASSEMBLY OF THE UNITS*

*Bud Radio, Inc., 1937 East 55th St., Cleveland, Ohio.
**519 Huron Rd., Cleveland, Ohio.

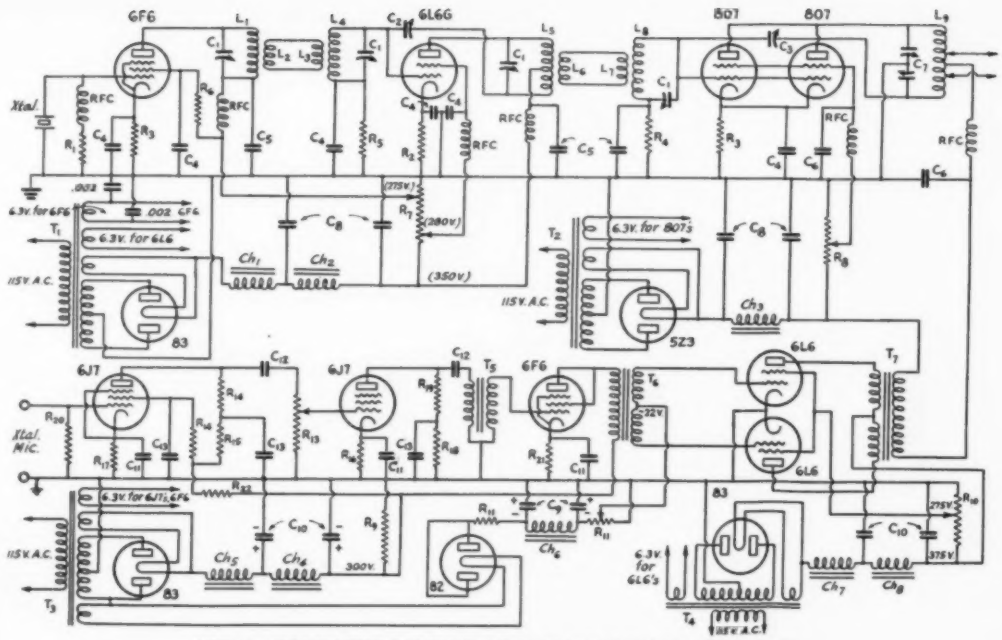



FIG. 1—COMPLETE CIRCUIT OF THE 'PHONE TRANSMITTER

*R.F. Section:*

$C_1$—100-$\mu\mu$fd. midget condensers (Bud No. 905).

$C_2$—16-$\mu\mu$fd. neutralizing condenser (Bud No. 311).

$C_3$—15-$\mu\mu$fd. neutralizing condenser (Bud No. 565).

$C_4$—0.01-$\mu$fd. 600-volt paper condensers.

$C_5$—0.002-$\mu$fd. 600-volt paper condensers.

$C_6$—0.002-$\mu$fd. mica condenser.

$C_7$—100-100-$\mu\mu$fd. split stator transmitting condenser (Cardwell MT100GD).

$R_1$—25,000-ohm 2-watt.

$R_2$—400-ohm 10-watt.

$R_3$—200-ohm 10-watt.

$R_4$—7500-ohm 10-watt.

$R_5$—10,000-ohm 2-watt.

$R_6$—50,000-ohm 2-watt.

RFC—2.5-mh. chokes.

*R.F. Power Supplies:*

$T_1$—800-volt c.t. power transformer with 5-v. and two 6.3-v. windings (U.T.C. UH-4).

$T_2$—900-volt c.t. power transformer with 5-v. and 6.3-v. winding (U.T.C. UH-5).

$R_7$—25,000-ohm 75-watt divider (Ohmite).

$R_8$—25,000-ohm 100-watt divider (Ohmite).

$Ch_1$—150-ma. swinging choke (U.T.C. CS-42).

$Ch_2$—10-h. 150-ma. choke (U.T.C. CS-41).

$C_8$—8-8-$\mu$fd. 600.

*Audio Power Supplies:*

$T_3$—800-volt c.t. power transformer with 2.5-v., 5-v., and 6.3-v. windings (U.T.C. UH-4).

$T_4$—900-volt c.t. power transformer with 5-v. and 6.3-v. windings (U.T.C. UH-5).

$Ch_4$—10-h. 150-ma. choke (U.T.C. CS-41).

$Ch_5$—150-ma. swinging choke (U.T.C. CS-42).

$Ch_6$—250-h. 15-ma. choke (U.T.C. PA-45).

$Ch_7$—200-ma. swinging choke (U.T.C. CS-304).

$Ch_8$—10-h. 300-ma. choke (U.T.C. CS-301).

$C_9$—8-8-$\mu$fd. 600.

$C_{10}$—8-8-$\mu$fd. 550-v. electrolytic (Aerovox GGL-5).

$R_9$—25,000-ohm 50-watt divider (Ohmite).

$R_{10}$—25,000-ohm 75-watt divider (Ohmite).

$R_{11}$—3000-ohm 10-watt resistor (Ohmite).

$R_{12}$—7500-ohm 25-watt resistor (Ohmite).

*Audio Section:*

$C_{11}$—10-$\mu$fd. 25-volt electrolytics.

$C_{12}$—0.25-$\mu$fd. 400-volt paper condenser.

$C_{13}$—0.1-$\mu$fd. 400-volt paper condenser.

$R_{13}$—0.5-meg. vol. control.

$R_{14}$—0.5-meg. 1-watt.

$R_{15}$—0.25-meg. 1-watt.

$R_{16}$—2000-ohm 1-watt.

$R_{17}$—5000-ohm 1-watt.

$R_{18}$—30,000-ohm 1-watt.

$R_{19}$—50,000-ohm 1-watt.

$R_{20}$—3-meg. 1-watt.

$R_{21}$—400-ohm 10-watt.

$R_{22}$—20,000-ohm 5-watt.

$T_5$—3-to-1 audio transformer (U.T.C. CS-1).

$T_6$—Class-AB input transformer (U.T.C. PA51AX).

$T_7$—Class-AB output transformer, push-pull 6L6 to 2500 ohms.

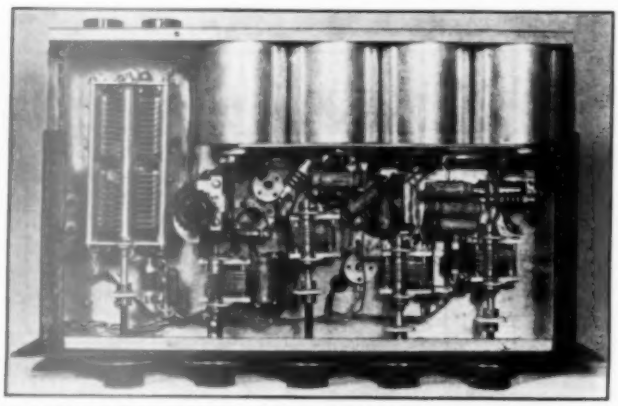
COIL DATA

| | 1.75 Mc. | 3.5 Mc. | 7 Mc. | 14 Mc. | 28 Mc. |
|---|---|---|---|---|---|
| $L_1$, $L_4$, $L_5$, $L_8$ | 60 t. No. 24 d.s.c., close-wound | 40 t. No. 24 d.s.c., spaced to fill 1¾" length | 20 t. No. 18 enam., spaced to fill 1¾" length | 9 t. No. 18 enam., spaced to fill 1¼" length | 5 t. No. 18 enam., spaced to fill 1¼" length |
| $L_2$, $L_3$, $L_6$, $L_7$ | 3 turns | 2 turns | 2 turns | 2 turns | 1 turn |
| $L_9$ | 44 t. No. 10 enam., 4" diam., spaced diam. of wire | 23 t. No. 10 enam., 3" diam., spaced diam. of wire | 13 t. No. 10 enam., 2½" diam., spaced diam. of wire | 6 t. No. 10 enam., 2½" diam., spaced diam. of wire | 4 t. No. 10 enam., 2½" diam., spaced diam. of wire |

Coils $L_1$ and $L_4$ are wound on 1½-inch diameter four-prong forms (Bud No. 125), and are interchangeable. Coils $L_5$ are wound on 1½-inch diameter five-prong forms (Bud No. 126). Coils $L_8$ are wound on 1½-inch diameter six-prong forms (Bud No. 310). Coils $L_9$ are wound on grooved Isotex forms (Bud No. 393, 4-inch diameter; No. 376, 3-inch diameter; and No. 383, 2½-inch diameter). Link turns are at "ground" ends of $L_1$, $L_4$ and $L_8$; and around centers of coils $L_8$.

6L6's, and gives the easiest and most effective 50-watt output that we have seen.

The complete job is built in one of the new adjustable-height relay racks that has recently appeared on the market. In the rear view it will be noted that there are two sections of the six that as yet have not been used, these being reserved for future additions. While sections of various heights are available in these extended racks, six of the 8¾-inch sections were used, because this left even spacing between all units and also brought the rack to the height we wanted, which is 5 feet 7 inches.



*THE SHIELDED PLUG-IN COIL ARRANGEMENT IN THE BOTTOM OF THE R.F. UNIT*

The first unit consists of a 6F6 pentode oscillator, 6L6G doubler-buffer, and the pair of parallel 807's in the final amplifier. An unusual feature of this r.f. section is that the coils are mounted horizontally under the chassis, each in its own shielded compartment. The links, as well as the coil windings, are wired to the coil bases. All coils are easily accessible for changing from the rear of the shelf. This method of mounting coils allows extremely short leads between coils and condensers, and plenty of room is left on the top of the chassis for correct placement of tubes, crystal, and final tank coil, making the net result of the arrangement conducive to good efficiency. The method used in mounting these coils was to drill four holes in the rear of the chassis 2½ inches in diameter. Behind each of these holes is mounted the shield can measuring 3 inches in diameter by 3½ inches deep, with a hole cut in the top to accommodate the socket for the coil mounting. By doing this it was possible to make the coils easily accessible for changing and still keep them well shielded from one another.

### R.F. CIRCUIT FEATURES

Referring to the diagram of Fig. 1, the set-up uses a 6F6 pentode crystal oscillator link-coupled to a 6L6 buffer-doubler, which in turn is link-coupled to the 807 final. The hook-up of the crystal stage is practically self-explanatory. It is merely the conventional circuit for any pentode oscillator. Cathode bias is used, since this limits the plate current flowing when the crystal is not in oscillation. The tap on the voltage divider supplying the oscillator B-plus is so adjusted as to allow the oscillator to furnish the necessary driving power to the 6L6 on the highest frequency to be used, the plate voltage being about 275 volts in this case.

The 6L6, it was found, works very nicely as either a buffer or doubler, since it is not necessary to put very high plate voltage on it to furnish the small amount of driving power required for the 807 stage. The only thing that is critical about this stage is to make sure that the screen voltage is correctly proportioned to the plate voltage. In this case the plate voltage was 350 volts and the screen tap on the voltage divider was set so that the screen had approximately 280 volts on it. If the screen voltage is too low, it will be found that the output of the 6L6 stage is materially decreased; while if the screen voltage is too high, a steady climbing of the screen-grid current will be noted during operation. Hence it is well to insert a meter in the screen grid lead when adjusting the voltage to make sure that the screen current remains steady.

Cathode bias is also used in the 6L6 buffer-doubler stage, and in the 807 stage. The values of grid and cathode resistors specified in Fig. 1 seem to satisfy all conditions. Care was taken to place chokes in all plate and screen leads, and by-pass condensers were used freely throughout the circuit. It was found that the small extra expense and effort was richly rewarded in the freedom from trouble experienced when the rig was put in operation; and since that time its consistency of operation has been very good.

The section directly below the r.f. unit contains the two power supplies for the r.f. It may seem a rather useless expense to some to use two separate supplies for the r.f. unit, but in this way it was possible to use the smaller transformers which are easily procured and also eliminated any possibility of instability in the crystal and buffer-doubler stages resulting from modulation of the final amplifier.

### THE AUDIO UNIT

The speech-amplifier consists of a 6J7 high-gain input stage driving another 6J7, triode connected. This two-tube amplifier works into the 6F6 triode-connected driver stage, which in turn drives the two push-pull Class-AB 6L6 modulator tubes. The grids of these two tubes are biased approximately 22 volts negative, making them run as

*(Continued on page 122)*

# Wide-Range Resonance-Type Frequency Meters with Sensitive V.T. Indicators

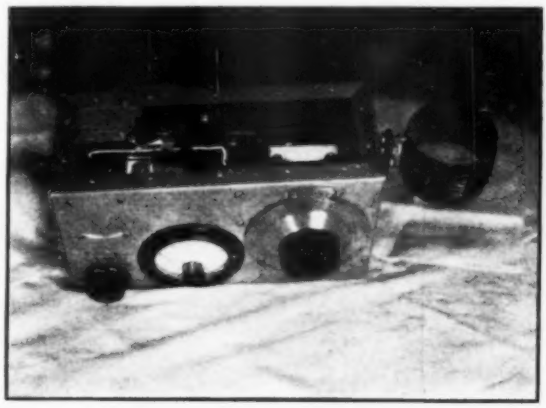
## Constructional Details of Two Practical Models

By Wolcott M. Smith*

IN THE course of frequency, inductance, or capacity measurements, a resonance-type "wavemeter" with a sensitive vacuum-tube resonance indicator is often as practically accurate for the work as a theoretically more accurate heterodyne instrument and frequently is more positive than the latter where confusion of harmonics is possible.

Temperature affects any tuned circuit's constants, so that compensation or correction for variation is needed for a high degree of accuracy with either type. High-*Q* circuits and a sensitive detector make the resonance meter closely approach the heterodyne meter in practical accuracy. It has the advantage of direct reading, thus eliminating spurious beats and occasional guess-work.

During construction of two such meters recently a highly sensitive detector was employed. The tuned circuits were designed with a comparatively good *Q* and rather large fields. These considerations resulted in a highly sensitive and sharply resonant meter of wide utility. For instance, at 6.0 Mc. with coupling to give 10% meter deflection, reaction of the resonance meter on the circuit under test caused the latter's frequency to change only 10 or 20 cycles. In checking this the frequency-meter coil was 30 inches from the small oscillator's coil. These results are believed to be at least as good as obtainable with commercial units now available. With careful construction, simplicity, stability, and long battery and tube life are characteristic.



PANEL VIEW OF THE LABORATORY PRECISION MODEL RESONANCE-TYPE FREQUENCY METER

The photographs illustrate types which have been built, one a small laboratory model which covers from 1.0 meter to 600 meters. The coils are wound 3 inches in diameter and 1 inch long, except at the highest frequencies. Large fields require single-turn windings for the two or three smallest coils. The large model was built for production work. Its range is 80 kc. to 20 Mc. with 5 coils. Because of the wider frequency ranges, the coil forms differ from those of the small unit. Accuracy is lower, of course, since there is seven times the kc. coverage per dial division.

The constructor who wishes to build one of these frequency-meters should consider dimensions carefully. The small unit is easier to use while the larger is easier of construction. Plenty of battery space is preferable to too little. A metal case about 6 inches wide, 7 inches high and 12 inches long is excellent. Standard dry-cell "A" batteries and a small 22½-volt "C" battery readily fit into one end. Room is left at the other end for tube, meter, and condenser.

The control panel, which is approximately 6 inches by 12 inches, should be laid out for convenient operation. Keep the tuning condenser near the coil jacks to shorten leads. Place the rheostat where its knob is out of the way when tuning. Keep the grid lead to the tube short. If possible, place the meter so that the eye catches its needle movement simultaneously with the dial setting. Make the case rigid and use a rugged tuning condenser and coils.

Battery straps must be made to fit each individual case. Several types of small "A" and "B" batteries are available for such services. They must be held in place firmly to prevent shorts or destruction of tube or meter. If necessary, place a baffle type shield between the meter and battery compartments.

### V.T. INDICATORS

Fig. 1-A, B, C, D shows several detector arrangements. Others were used but proved too inferior to warrant comment here. For high-frequency work the 954 and 955 tubes were found

*F. W. Sickles Co., Springfield, Mass.

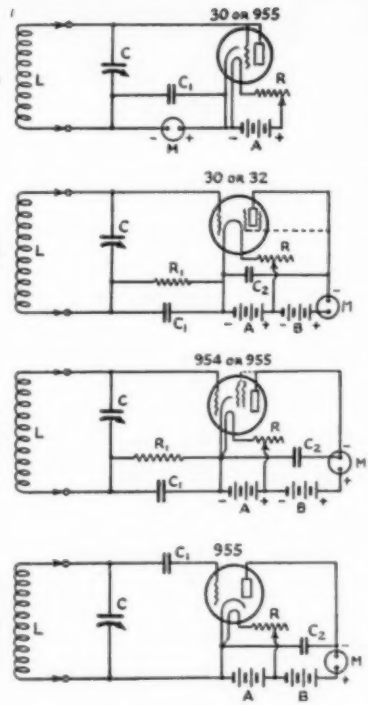



*FIG. 1—RESONANCE-METER CIRCUITS WITH DIODE AND TRIODE INDICATOR ARRANGEMENTS TESTED*

*The triode types are preferable, as explained in the text, especially with the "acorn" tubes. Typical circuit values are as follows:*
*L—See coil table*
*C—50-μμfd. straight-line-frequency condenser (General Radio Type 568-K).*
*$C_1$—100-μμfd. mica fixed*
*$C_2$—0.001-μfd. mica fixed*
*R—25-ohm filament rheostat with switch*
*$R_1$—30- to 50-megohm leak resistor*
*A—Filament battery, 1.5-volt for Type 30 or 32 tubes, 4.5-volt for Type 954 or 955 tubes*
*B—Small 22.5-volt type "B" battery*
*M—0-200 d.c. microammeter*

superior to any of the older types. Above 15 Mc. their superiority was marked. Fig. 1-A is the original diode detector. Its sensitivity is good but, unfortunately, such a rectifier loads the tuned circuit so that tuning is broad. It is useful enough, though, so that it is employed commercially.

Circuits B, C, D eliminate this loading and are much more sensitive than any diode. Should a tetrode or pentode be used, the screen and suppressor are tied to the plate to form a triode.

Essentially, the indicator is a triode voltmeter. The variation from standard practice lies in the control of initial electron current. This is effected by cathode or filament temperature control, or emission control, rather than by variation of grid bias or plate voltage. In operation the initial plate current is set to 150 to 200 microamperes by operation of the filament rheostat. As a signal is tuned in, grid bias is developed, by rectification in the grid circuit, across the high leak. This bias reduces the plate current greatly when the "B" voltage and the cathode temperature are right.

Fortunately, a 22½-volt "B" supply fills the bill for the units tried and cathode temperature is readily controlled. Excessive "B" voltage requires too-low temperatures for the cathode and the plate pulls all the available electrons regardless of grid-voltage conditions. Too-low a "B" supply requires excessive cathode temperatures and space charge prevents satisfactory grid control. The best plate voltage lies between 18 and 25 volts. Battery and tube life are no problem, as both are operated far below normal ratings.

The circuit of Fig. 1-D has no added leak across the grid condenser. To prevent sluggish action in the indicator, keep the deflection to 50 microamperes from initial value. This holds the grid condenser discharge time within reasonable limits. The detector thus arranged is so sensitive that it may be necessary to keep one or two hundred feet from the transmitter and antenna when tuning to resonance with the fundamental frequency. A 30-microampere deflection occurred, for instance, 15 feet from the oscillator alone at W1ES.

### COILS AND CALIBRATION

Coil construction is relatively simple. The coil table can be followed or an *A.R.R.L. Lightning Calculator* will do the work quickly and accurately. In any case, keep the diameter large and the wire spacing about 75% of the wire diameter. If possible, use tubing which is properly threaded for each coil; otherwise, wind string or heavy cord as a spacer and leave it there.

*COIL TABLE*

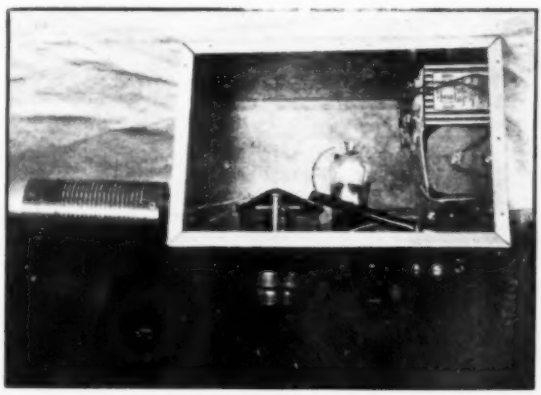
| *Coil* | *Range* | *Diam.* | *Winding Length* | *T/in.* | *Wire* | *Turns* | *L* |
|---|---|---|---|---|---|---|---|
| A | *160 to 300 Mc.* | *Bar between the two plugs* | | | | | *0.007 μh.* |
| B | *84 to 160 Mc.* | *2"* | *Nil* | | *Tubing* | *1* | *0.058 μh.* |
| C | *44 to 84 Mc.* | *2"* | *1"* | *2.* | *Tubing* | *2* | *0.23 μh.* |
| D | *23 to 44 Mc.* | *2"* | *2"* | *2.5* | *Tubing* | *5* | *0.83 μh.* |
| | | *3"* | *1"* | *3.* | *Tubing* | *3* | *0.83 μh.* |
| E | *12 to 23 Mc.* | *2"* | *2"* | *4.5* | *No. 10 en.* | *9* | *3.0 μh.* |
| | | *3"* | *1"* | *5.5* | *No. 10 en.* | *6* | *3.0 μh.* |
| F | *6.7 to 12 Mc.* | *2"* | *2"* | *8.4* | *No. 15 en.* | *17* | *10.0 μh.* |
| | | *3"* | *2"* | *6.* | *No. 12 en.* | *12* | *10.0 μh.* |
| | | *3"* | *1"* | *10.* | *No. 16 en.* | *10* | *10.0 μh.* |
| G | *3.4 to 6.7 Mc.* | *2"* | *2"* | *15.7* | *No. 20 en.* | *31* | *35.0 μh.* |
| | | *3"* | *2"* | *11.4* | *No. 18 en.* | *23* | *35.0 μh.* |
| | | *3"* | *1"* | *19.* | *No. 22 en.* | *19* | *35.0 μh.* |
| H | *1.8 to 3.4 Mc.* | *2"* | *2"* | *31.* | *No. 24 en.* | *62* | *132.0 μh.* |
| | | *3"* | *2"* | *22.* | *No. 18 en.* | *44* | *132.0 μh.* |
| | | *3"* | *1"* | *37.* | *No. 24 en.* | *37* | *132.0 μh.* |
| I | *.95 to 1.8 Mc.* | *2"* | *2"* | *57.* | *No. 28 en.* | *114* | *455.0 μh.* |
| | | *3"* | *2"* | *41.5* | *No. 26 en.* | *83* | *455.0 μh.* |
| | | *3"* | *1"* | *69.* | *No. 30 d.s.c.* | *69* | *455.0 μh.* |
| J | *.50 to .95 Mc.* | *2"* | *2"* | *109.* | *No. 34 s.s.c.* | *218* | *1680 μh.* |
| | | *3"* | *2"* | *81.* | *No. 30 s.s.c.* | *162* | *1680 μh.* |
| | | *3"* | *1"* | *134.* | *No. 36 s.s.c.* | *134* | *1680 μh.* |

*This table is good only for tuning capacity of 15 to 65 μμfd. It is calculated at 16 or 17 to 60 μμfd. approximately, in order to allow reasonable overlap between ranges.*

Bake the coils thoroughly dry and give them several coats of radio-frequency lacquer, preferably "Victron." Coil supports, jack insulators, and tube socket should be "Victron" sheet, although a good grade of bakelite is satisfactory. Single-turn coils of tubing should be lacquered to prevent corrosion.

Calibration can be taken from any calibrated source of r.f. power. An oscillating detector in zero-beat with a known source will serve. In this way the Bureau of Standards or the A.R.R.L. Standard Frequency stations can be used. Lecher wires are best at the ultra-high frequencies. *But keep the frequency-meter coil well away from all other circuits and objects during calibration and use.*

The parts cost, even when buying everything, should be under $35.00: Commercial units with the diode detector net about $100.00 when completely calibrated. The persistence of calibration can be made as good as with any other type by proper care in construction. A well-built job will last a long time if handled with even reasonable care.



*VIEW OF THE PRODUCTION TYPE INSTRUMENT ILLUSTRATING THE INTERNAL CONSTRUCTION*

There are many uses for these meters. Among them are such special jobs as checking harmonic content in the transmitted wave, antenna guy-wire oscillation, pickup in light and power wiring, relative field strength, etc. The detector alone, with the condenser set at minimum, makes a nice a.c. peak voltmeter. Because of the extreme sensitivity, much can be accomplished which other frequency-sensitive devices cannot touch—making this type meter a welcome addition in any amateur shack.

## Strays

That 50-cycle undertone which identified the southern California 6's has largely disappeared since the changeover to Boulder Dam 60-cycle juice in the L.A. area. Thus time works another change.

## A Few More Receiving Tubes—6V6G, OZ4G, 6H5, 25L6

THE current month has seen the addition of three new tube types to the receiving list. The 6V6G, a beam power tube designed for applications where the 6L6 would be uneconomical, has been announced by Ken-Rad; Raytheon has two new types in the OZ4G rectifier and the 6H5 electron-ray tube; and a "110-volt" beam tube, the 25L6, is added to the RCA line.

### The 6V6G

Built particularly with automobile radio in mind, the 6V6G is a high-efficiency tetrode of the beam type, capable of giving high output with comparatively low filament and plate currents. Characteristics and operating conditions are given below:

| | |
|---|---|
| Heater voltage | 6.3 volts |
| Heater current | 0.45 amp. |
| Amplification factor | 218 |
| Plate resistance | 52,500 ohms |
| Mutual conductance | 4100 micromhos |
| Total plate and screen dissipation | 12.5 watts |

*Class-A Amplifier, Single Tube*

| | |
|---|---|
| Plate voltage | 250 volts |
| Screen voltage | 250 volts |
| Grid voltage | 12.5 volts |
| No-signal plate current | 45 ma. |
| Full-signal plate current | 47 ma. |
| No-signal screen current | 4.5 ma. |
| Full-signal screen current | 6.5 ma. |
| Load resistance | 5000 ohms |
| Power output | 4.25 watts |
| Self-biasing resistor | 240 ohms |

Under the operating conditions outlined above, the second-harmonic distortion is 4.5 per cent, and the third harmonic 3.5 per cent.

| Push-Pull Class-AB Amplifier | | | |
|---|---|---|---|
| Plate voltage | 250 | 300 | volts max. |
| Screen voltage | 250 | 300 | volts max. |
| Grid voltage | −15 | −20 | volts |
| No-signal plate current * | 70 | 78 | ma. |
| Full-signal screen current * | 79 | 90 | ma. |
| Full-signal screen current * | 5 | 5 | ma. |
| Load resistance (plate to plate) | 10,000 | 8000 | ohms |
| Power output | 8.5 | 13 | watts |

* For two tubes.

Total harmonic distortion, 4 percent; third harmonic, 3.5 per cent. The 6V6G has the octal base with glass bulb. Pin connections are the same as for the 6L6G.

### The OZ4G

The OZ4G is a full-wave gas-filled rectifier developed for use in vibrator-type "B" supplies for automobile receivers. The voltage drop is essentially constant over the usable load-current values.

*(Continued on page 112)*

# An Inexpensive 160-Meter 'Phone for Local Rag Chews

By Walter van B. Roberts,* W3CHO

IT IS usually inconvenient to reduce power and shift bands on the "big rig" for local rag chewing on 160-meter 'phone, so that a small separate low-power transmitter is a useful adjunct to an amateur station. At any rate, the writer wanted such a little 'phone transmitter and decided to see what could be done with standard receiving equipment. After a few experiments the circuit of Figs. 1 and 2 was built into a small receiver cabinet as shown in the accompanying photos. It will be observed that by using a 25Z5 as a voltage doubler, the necessity for a power transformer was eliminated, while series modulation avoids any modulation transformer or choke yet gives the same sort of results as ordinary plate modulation. Thus the only parts required are such as can be bought cheaply in almost any radio store. The plate input of the 43 final r.f. stage is about 30 ma. at 100 volts, so that the output is of the order of two watts. The 43 being a screen-grid tube does not require neutralization, at least on the 1.75-Mc. band. A separate tuned circuit is employed at the input of the final stage, to permit adjusting the excitation, and to make it possible to tune the final grid to a harmonic of the oscillator. The set has not yet been operated this way (on a harmonic), however.

Three flashlight cells mounted inside the cabinet act as microphone batteries, the microphone plugging into a socket at one end of the cabinet. A single-pole single-throw toggle switch puts voltage on the filaments, while a double-pole single-throw toggle simultaneously closes the microphone circuit and applies voltage to the rectifiers for transmitting. A pair of pin jacks on the front panel permits a milliammeter to be plugged into the final plate circuit for adjustment. These jacks are shown shorted, since the milliammeter is not necessary once the rig is tuned up. The a.c. power lead comes out the right end of the cabinet, where another pair of pin jacks is located, one connected to the chassis through a large condenser and the other connected through an r.f. by-pass condenser to a clip that may be attached

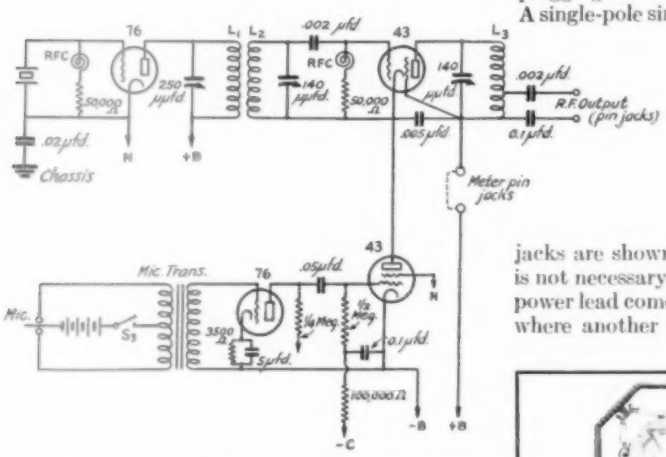



*FIG. 1—CIRCUIT OF THE R.F. AND AUDIO SECTIONS OF THE 160-METER RAG-CHEW 'PHONE*

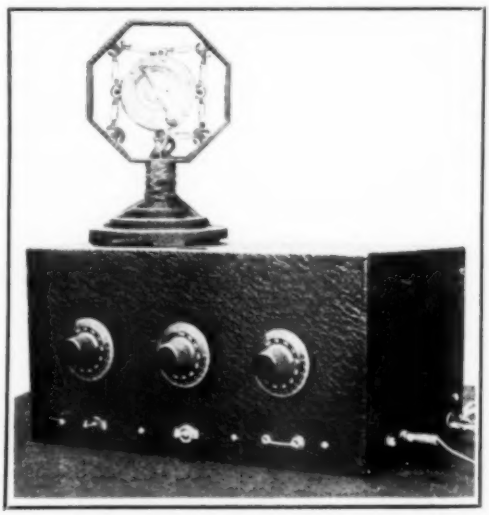
*$L_1$—Crystal oscillator plate coil, 35 turns No. 22 d.c.c., 1½-inch winding length.*

*$L_2$—Final grid coil, 45 turns No. 26 d.c.c., 1½-inch winding length.*

*$L_3$—Final plate coil, 55 turns No. 20 d.c.c., 2½-inch winding length.*

*All coils are wound on 1½-inch diameter forms. $L_1$ and $L_2$ are wound end-to-end on the same form with ½-inch separation between coils.*

*Switches $S_2$ and $S_3$ are a single d.p.s.t. toggle.*



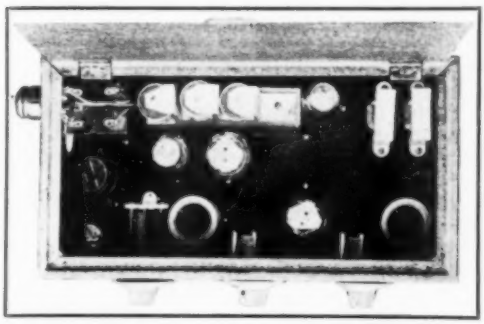
*THE QRP 'PHONE RIG FOR LOCAL RAG CHEWING IS BUILT IN A RECEIVER CABINET*

***Expensive power supply equipment is eliminated by use of a voltage-doubling rectifier circuit and series filament operation.***

*155 Hodge Road, Princeton, N. J.

to any desired part of the final tank coil. The output is taken from these jacks.

More recently a modified 6L6 has come out for operation in transformerless sets. It is called the 25L6 and at zero grid potential has about twice the plate current of a 43, while plate current cut-off is produced by about half the grid voltage required by the 43. It would appear that



A PEEK INTO THE TOP OF THE TRANSMITTER CABINET REVEALS NEAT AND UNCROWDED ASSEMBLY

this new tube should work better in the transformerless transmitter than the 43. Although there has not been opportunity to try this new tube, it is unlikely that much change would have to be made in adapting the set to use a 25L6, since the heaters are the same.

However, due caution should be exercised in making the changes required by the greater current, for instance, in the bias supply for the modulator, grid leak for the final, etc. Perhaps it would be best to use cathode resistor bias for the modulator, since only about 8 volts are needed. It seems likely that about four watts carrier output could be realized with this tube—which will be more than a mere local rag chew job would need, considering all the R9 reports received up to twenty miles distance in daytime on 160 'phone with the 43's 2-watt output.

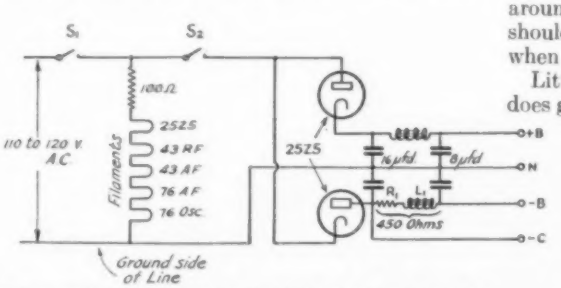



FIG. 2—THE TRANSFORMERLESS POWER SUPPLY CIRCUIT

*A total resistance of approximately 450 ohms was found correct for $L_1$ and $R_1$ in series, but it may be preferable to use a variable resistor for $R_1$ and adjust bias to make the d.c. voltage drops between plate and cathode of each 43 about equal when the final amplifier is excited and tuned but not modulated.*

This little rig, used on the 1.75-Mc. band with a quarter-wave antenna worked against ground, gets R9 reports at 10 to 20 miles, and has even been reported R7 at 70 miles, all daytime. At night there are usually too many strong signals on this band to do much in the way of finding out what it can really do on DX. Its chief merit is that it is cheap and can be left all connected up so that by merely switching the antenna from the big rig to the little one and throwing on the power, you are ready for local work.

## Eclipse Expedition

*(Continued from page 12)*

B. King, Jr., W2BWF-W1GSH; H. Selvidge, W9BOE; John Alvin Pierce, ex1EB now W1JFO, and E. P. York, all of Cruft Laboratory; and Jackson Cook of M.I.T. The journey of the radio group was made possible through the generosity of RCA Communications, Inc. A complete list of many others who assisted in making the expedition possible is contained in the official report of the expedition in *The Technology Review*, November, 1936.

## Boosting Output of L.-P. Transmitter

*(Continued from page 17)*

justed by bending the tank link coil until the tube is operating at 150 ma. input. Remember, though, that there's enough voltage floating around to qualify the operator for "Silent Keys" should he forget to disconnect the plate voltage when making any of these tank coil adjustments.

Little more need be said—except that the rig does get out. And who can deny that that's what we are after?

## Strays

Here's a way to settle one of life's minor annoyances—the question of whether or not the soldering iron is really "on" when it doesn't heat up as you think it should. Hold the wooden handle against your ear; if you hear a hum the current is on. If not, look, to the plug or socket; the circuit is open somewhere.

—···—

W1BDF is seriously considering the purchase of one of those "field strengthening" meters advertised in September *QST* (page 85). If it were only as simple as that!

—···—

Judging by some of the sounds heard during the Sweepstakes, a good many of the gang must have been under the impression that Rule 382 was suspended for the duration of the contest.

# Dual-Triode Phase Inverters as Push-Pull Audio Drivers

## Characteristics and Practical Operating Data for Typical Amplifier Combinations

By Curtis R. Hammond*

THE new beam-power tubes have created the demand for a simple push-pull driver having the desirable characteristics of low distortion, high gain, and wide frequency response. The phase inverter type of driver incorporating two triodes fills the above requirements with the additional advantage of low cost as a result of the reduction in the number of component parts necessary. In applications where a minimum amount of space is available, the double triode is of special advantage.

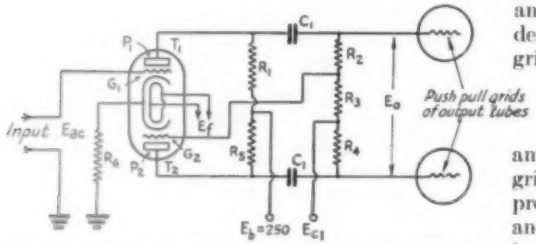



*FIG. 1—THE DUAL-TRIODE PHASE-INVERTER CIRCUIT*

*Circuit values and operating conditions for different types of tubes are given in the table.*

The theory of the phase inverter is not difficult and can be explained simply as follows: In the circuit of Fig. 1, $E_{ac}$ develops a voltage across $R_1$ that also appears across $R_2$ and $R_3$. The voltage across $R_1$ is 180° out of phase with $E_{ac}$, and if a portion of this voltage is fed to $G_2$ the resulting voltage output of $P_2$ in $R_5$ is in such phase relation that the grids of the output tubes, driven by $P_1$ and $P_2$, are in the proper phase relation for push-pull operation.

To drive the output tubes properly the grid swing to each tube must be equal. To obtain this condition the voltage output of $T_1$ and $T_2$ must be equal. This is accomplished by dividing the output of $T_1$ with the resistors $R_2$ and $R_3$ so that the ratio of the voltage across $R_3$ to the total voltage across $R_2 + R_3$ is equal to the reciprocal of the amplification of the triode $T_2$. Although $T_2$ and $T_1$ do not have to be similar triodes, for any combination the above ratio must hold true. In many applications it is desirable to use a high-gain triode for $T_1$ and a low-gain tube for $T_2$. The circuit of Fig. 2 shows the two-tube phase inverter.

The tube complement for the inverter stage is usually chosen to give the particular gain required with the limitations imposed by the plate and grid resistor values. For example, a driver is desired with medium gain to drive push-pull grids that can tolerate a maximum grid-return resistance of 50,000 ohms. This value is then that of $R_4$ and also the sum of the resistances $R_2$ and $R_3$. Conventional resistance-coupled amplifier theory for the calculation of plate and grid resistors would limit the plate resistor to approximately one-half the value of the grid resistor, and $R_1$ and $R_5$ would therefore have to be approximately 25,000 ohms. The parallel impedance of these two resistors is 16,700 ohms and the plate resistance of a tube to operate satisfactorily with this load should be less than 8,000 ohms (approximately). The types 6C5, 56, 76, 6R7, 6A6, 53, 6N7, would be satisfactory if the voltage output need not be too large. For low distortion and a high-voltage output the 6E6 would be better. The choice in any case depends upon the results desired.

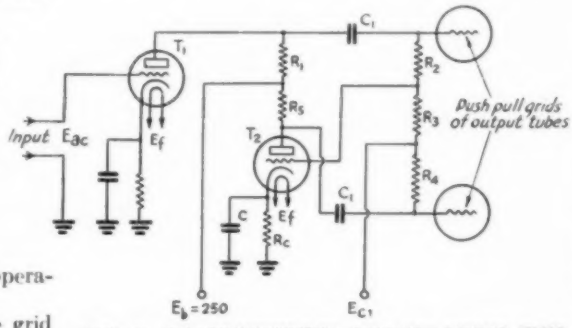



*FIG. 2—PHASE-INVERTER CIRCUIT USING TWO SEPARATE TRIODES*

*$T_1$ is usually a high-gain triode and $T_2$ a low-gain triode, although $T_1$ may be a pentode in cases where high amplification is desired. The gain of $T_2$ is kept low so that the ratio $R_3/(R_2+R_3)$ can be maintained at some fixed value.*

*Ken-Rad Tube and Lamp Corporation, Inc., Owensboro, Ky.

Having selected a tube for the inverter, the gain can be calculated and $R_2$ and $R_3$ evaluated from the relation,

$$\frac{R_3}{R_2 + R_3} = \frac{1}{\text{Gain}}.$$

The stage gain can be calculated by graphical methods with the aid of a plate current family or by using the equation

$$\text{Gain} = \mu' = \frac{\mu R_L}{R_p + R_L}.$$

$R_L$ is the parallel resistance of the plate resistor and the grid resistor of the following tube, while $R_p$ and $\mu$ are plate resistance and amplification factor at the operating point. Published values of $\mu$ and $R_p$ can be used with fair accuracy, provided that the plate load is not more than three times the plate resistance of the tube and the bias low enough that the operating point is not in the region of crowded plate current curves.

Typical operating conditions have been chosen and the various circuit components evaluated for several typical phase inverter tubes. The data are assembled in the table and show, in addition to circuit component values, the approximate gain per triode, maximum output volts, operating bias, and plate current for each system.

### TWO-TUBE COMBINATIONS

The component values for single tubes listed in the chart may be used to determine operating conditions for the inverter tube of a circuit similar to that of Fig. 2. In such a circuit, $T_1$ can be a high-gain triode or pentode and $T_2$ can be one of the low-gain triodes of the chart. The high-gain values of $R_5$, $R_2$, $R_3$, $R_4$ and $C_1$ should be used. The value of $R_c$ should be twice that listed for $R_6$ in the chart.

As a typical example, a type 75 high-mu triode may be used for $T_1$ and a Type 76 used for $T_2$. The high-mu tube could use a 0.25-megohm plate resistor with the sum of $R_2$ and $R_3$ equal to 0.5 megohm. The 0.5-megohm grid return resistance is especially desirable because the inverter tube high-gain values in the chart give 0.5 megohm as the grid resistor. The values of $R_5$, $R_2$, $R_3$, $R_4$ and $C_1$ can then be taken directly from the chart. The plate current, gain, and other characteristics are also applicable.

If two dissimilar triodes are used, individual bias resistors and by-pass condensers are not

OPERATING CONDITIONS FOR SIMILAR TRIODES

| *Tube Type* | $R_6$ | $R_1$ $R_5$ | $R_2$ | $R_3$ | $R_4$ | $C_1$ | *Gain Per Triode* | ***Peak Output Volts $E_o$ Approx.* | *Grid Bias Volts* | *Plate Current Per Triode* |
|---|---|---|---|---|---|---|---|---|---|---|
| *6A6<br>53<br>6N7<br>6N7G | 3,000 | 250,000 | 481,500 | 18,500 | 500,000 | 0.1 μfd. | 27.0 | 128 | − 3.2 | 0.53 Ma. |
| 6A6<br>53<br>6N7<br>6N7G | 670 | 25,000 | 46,700 | 3,230 | 50,000 | 1.0 μfd. | 15.5 | 95 | − 3.5 | 2.6 Ma. |
| 6E6 | 1,500 | 25,000 | 40,000 | 10,000 | 50,000 | 1.0 μfd. | 5.0 | 125 | − 15.0 | 5.0 Ma. |
| 2-76<br>2-56 | 2,250 | 50,000 | 455,000 | 45,000 | 500,000 | 0.1 μfd. | 11.0 | 169 | − 9.0 | 2.0 Ma. |
| 79 | 3,000 | 250,000 | 489,000 | 11,000 | 500,000 | 0.1 μfd. | 47.0 | 124 | − 2.0 | 0.33 Ma. |
| *2-6C5<br>2-6C5G | 1,710 | 50,000 | 464,300 | 35,700 | 500,000 | 0.1 μfd. | 14.0 | 146 | − 6.5 | 1.9 Ma. |
| 2-6C5<br>2-6C5G | 980 | 25,000 | 45,000 | 5,000 | 50,000 | 1.0 μfd. | 10.0 | 114 | − 6.5 | 3.3 Ma. |
| *2-6R7<br>2-6R7G | 1,600 | 50,000 | 458,000 | 41,600 | 500,000 | 0.1 μfd. | 12.0 | 143 | − 7.0 | 2.2 Ma. |
| 2-6R7<br>2-6R7G | 750 | 25,000 | 44,750 | 5,250 | 50,000 | 1.0 μfd. | 9.5 | 95 | − 6.0 | 4.0 Ma. |

*High gain values.
** Maximum output obtained with a nominal amount of distortion. The output for 5% total harmonics is somewhat less than this value.

necessary. The cathode of the tube $T_1$, which is normally a high-gain tube using a low value of bias, may be connected to a tap on the cathode resistor of $T_2$. The resistance from the tap to ground would normally be low and the only by-pass condenser necessary would be that across the total resistance.

For several types, two operating conditions are shown. For these types a high-gain condition is given and low-gain constants are shown that allow a grid resistor of only 50,000 ohms to be used. Although this condition results in a much lower gain than is normally obtained, it makes possible the use of the phase inverter to drive fixed-bias Class-A and Class-AB output systems that use 50,000-ohm grid return resistors. The 6L6, for example, can be operated push-pull Class-AB with fixed bias to give 34 watts of undistorted output. This condition limits the grid return resistor to 50,000 ohms and any one of the drivers listed for operation with $R_4 = 50{,}000$ may be used.

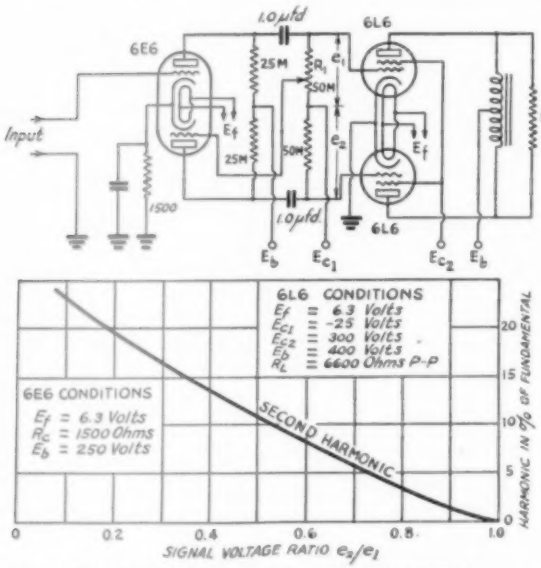



*FIG. 3—SHOWING THE CHANGE IN DISTORTION FOR UNBALANCED SIGNAL TO GRIDS OF PUSH-PULL CLASS-AB 6L6 STAGE; $e_1$ AND $e_2$ BEING THE SIGNAL VOLTS TO THE 6L6 GRIDS*

***The signal voltage ratio $e_2/e_1$ is varied by the volume control $R_1$. Each 6L6 develops a second harmonic that is cancelled because of the push-pull connection. If $e_1$ and $e_2$ are unbalanced, the second harmonics in the load are not equal and are not cancelled.***

BALANCE IMPORTANT

Experience with phase inverters has shown that the high-gain types using tubes such as the 79 or 6N7 are not always satisfactory because of unbalance of the two triodes. On production lines the high-gain inverter is difficult to balance because resistors $R_3$ and $R_2$ must be held to a very close tolerance. Also, at high frequencies the tube and circuit capacitances in shunt with resistors disrupt the balance that may exist at low frequencies.

The degree of unbalance that may be tolerated depends upon the type of output tubes used. Output tubes that are over-biased usually develop a high second harmonic in each tube that is canceled because of the push-pull connection. Class-AB systems whose operation is restricted to negative grid regions come in this class. But phase-inverter drivers must be balanced at all frequencies if undistorted output is desired. The curve of Fig. 3 shows the distortion that results from an unbalanced signal to the grids of Class-AB 6L6's. The distortion is second harmonic and results from the fact that one tube is driven to a greater output than the other. The Class-AB 6L6 system is typical of push-pull output tubes that develop a high second harmonic in each tube. Amplifiers of this type must be balanced or the second harmonic generated in each tube will not be canceled.

## The 807 as a Crystal Oscillator

*(Continued from page 19)*

ever the center-tap arrangement probably allows more latitude in key click filters and has the advantage of being electrically behind the entire filter system.

As to results and operation, very little more could seem to be desired. Power inputs varied from 24 watts to 40 watts with varying values of plate voltage and plate-grid condenser $C_2$. In comparison with the 6L6, the 807 appears to offer a greater stability and efficiency. It does not want to draw as much power as the 6L6 but does give more stable power output in the antenna. It offers definitely greater advantages at the higher frequencies. In other words, the results completely fulfilled the desires and exceeded the expectations. Later additions of power in this shack will certainly see the 807 in operation as oscillator or amplifier or both. Beam power means economy and results to the ham. In the short time in operation, the RST reports have all been of the 599X or 589 variety. Sufficient signal strength and stability have been shown to work through a surprising lot of QRM.

## Strays

In the description of the 6L6 Tri-tet in November *QST*, mention of $C_5$ in the diagram on page 36 was inadvertently omitted. It is a 100-μμfd. midget, the condenser itself being a Cardwell Type ZU-100-AS.

# About R.F. Voltage and Current Ratings of Mica Transmitting Condensers

THROUGH the years of blowing condensers in power-supply filter circuits, hams have learned pretty well the lesson of how to decide on condenser voltage ratings for that particular job. But when it comes to picking out a blocking or by-pass condenser of suitable ratings for r.f. circuits, a good deal of fog exists. As a means of clearing up this situation, we give below some extracts from material prepared by the engineering department of Aerovox.[1]

Mica condensers are employed mostly for bypassing plate, screen, grid or filament circuits. The required rating for these condensers has been a mystery to many and few understand why it is necessary, for instance, to employ condensers with a 5000-volt rating when the highest voltage applied to the plates of the tubes is only 1500 volts.

There is also a widespread belief that the mica condenser can stand the maximum a.c. working voltage regardless of frequency, which is very far from the truth. All condensers heat up somewhat because of the current flowing through them. This current is out of phase with the impressed voltage, it is true, and serves to charge and discharge the condenser all the time. However, there is some heating caused by ohmic loss from current flowing through the terminals and the plates, and there are some dielectric losses which are transformed into heat. Consequently, there is a definite limit to the amount of current the condenser can carry, or rather to the power which can be dissipated by a condenser. This power remains approximately the same for all frequencies, but since the reactance of the condenser varies, the permissible current varies with frequency and with the capacity.

There are, therefore, two maximum ratings to the mica condenser, neither of which should be exceeded. The first is the voltage rating; the second is the current rating, which varies with frequency and capacity.

At certain frequencies one will be limited by the voltage rating only because that limit will be exceeded before the maximum current rating has been reached; this happens at low frequencies and for small values of capacitance. However, at higher frequencies and for higher capacitance the current increases for the same applied voltage and soon it is the current rating which is the first to be exceeded. This happens at high frequencies and practically always at frequencies employed by amateurs. In these cases the condenser is badly overloaded when the applied voltage is still far below the maximum voltage rating.

[1] From *Aerovox Research Worker*, October, 1936.

In order to use mica condensers intelligently, the designer must determine the current, voltage and frequency to which they will be subjected, and then he should determine which condenser will be satisfactory for the purpose. When the condenser is subjected to both a.c. and d.c. voltages, the sum of the d.c. voltage plus the peak a.c. voltage should not exceed the d.c. working voltage rating.

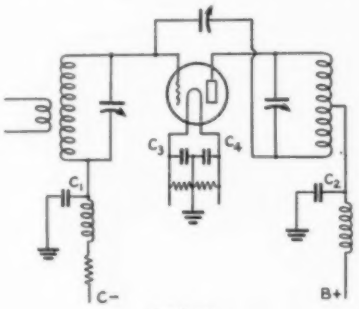



*FIG. 1*

Determining the amount of current actually flowing through a by-pass condenser or the voltage across it will no doubt be the hardest task for the amateur. These quantities can either be measured or calculated. Since most amateurs have a radio-frequency ammeter, it is a good plan to place such a meter in series with the by-pass condenser in question in order to measure the current. It is true that the insertion of the ammeter changes the conditions somewhat but it would give an approximate idea.

The vacuum-tube voltmeter is another means for determining the voltage or the current. Measure the voltage across the condenser with the v.t. volt-meter and calculate the current by the equation:

$$I = \frac{2\pi f C E}{1000}$$

where $f$ is in kc.
$C$ in microfarads
$E$ in volts,
$I$ in amps.

The cathode-ray oscilloscope also can be used as a measuring instrument. Connecting the vertical plates across the condenser one can measure the height of the pattern, which can be read in volts when the sensitivity is known. The current can then be calculated as before.

When measurement is not feasible, calcula-

(*Continued on page 116*)

# An Optical Pyrometer for Measuring Tube Plate Dissipation

By A. D. Mayo, Jr.,* W4CBD/9

IN ORDER to get an accurate check on the plate efficiency of a grid-modulated 211, an optical pyrometer was designed in its simplest form, built from the junk box, and found to give excellent results.

A pyrometer is a device to measure high temperatures. An optical pyrometer has a known variable, the amount of current needed to light a filament, changed to correspond to an unknown by sighting at the unknown right through the filament and adjusting so that the filament outline disappears. In this application the necessity of bothering with temperatures and currents is eliminated, since we can plot the scale of a rheostat directly against tube dissipation watts. Once this relation has been established and charted, it becomes a matter of only a few seconds to determine the dissipation of a tube operating in the transmitter.

The use of the instrument is limited, however, to operating conditions where the tube shows noticeable color. For this reason it is not applicable to equipment using carbon- or graphite-plate tubes at or near their rated input. Some fellows using 852's or Eimacs may find it useful to determine how much of the kilowatt is coming out of the final.

All of the parts are mounted on an elongated wooden box made up of four pieces of "apple" box material ¼ by 2 by 10 inches, and left open at the ends. Along the top of the box a piece of resistance wire 9 inches long, having a resistance of about 2 ohms, is stretched and secured to the wood by brass machine screws. Above this is mounted a length of square brass rod equipped with a slider to contact the resistance wire. Machine screws passing through ½-inch bakelite cubes secure the slider to the box at the ends. A flashlight bulb is mounted in a socket inside the box so that it may be lined up on an object, when the box is sighted through. Two flashlight cells are held in place on the bottom by a short length of wood which is in turn bolted in place. A rheostat and toggle switch are also secured to the bottom board so that they may be reached easily.

The scale which is to be read is laid off on a piece of heavy paper and then cut to a width of slightly less than ¼ inch. Then it is pasted along the top of the square brass rod. If the brass has a polished finish it may be necessary to roughen with a course round file or wood rasp

(Continued on page 96)

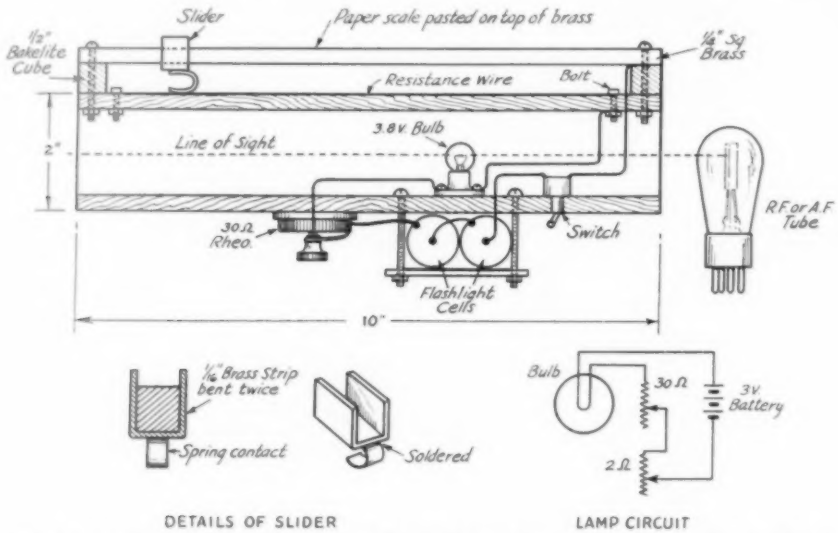



*FIG. 1—SKETCH OF THE ASSEMBLY AND CONNECTIONS OF THE SIMPLE OPTICAL PYROMETER FOR MEASURING PLATE DISSIPATION*

*Engineering Department, Burgess Battery Co., Freeport, Ill.

# Note on Auto-Transformer Design

By T. W. Hopkinson,* W3AVR

A FEW months ago there appeared in *QST* an article on using the auto-transformer for voltage control.[1] Included was a description of how to make an auto transformer from an old broadcast-set power transformer. It may be that some of us will want to build one to handle more power than the primary of an old b.c. transformer will stand, or to get more voltage variation as well as better efficiency. It is the purpose of this article to show how simple it is to design an auto transformer to meet one's specific needs. This is most easily done by an example.

Suppose we have a plate supply transformer that gives 1000 volts each side of center-tap and we wish to drop the voltage to 700 volts each side for reduced power operation—or we may wish to use the transformer permanently in a 700-volt power supply. Since only one side of the secondary is utilized at a time, our calculations will be made from one-half secondary to primary. First find the primary voltage necessary to give a secondary voltage of 700. The secondary to primary ratio is:

$$\frac{1000}{110} = 9.1.$$

The primary voltage necessary to give 700 volts in the secondary is:

$$700 \div 9.1 = 77 \text{ volts.}$$

Next, determine the primary current from the secondary current, which say for example is 300 milliamperes.

Primary current = turns ratio × secondary current

$$9.1 \times .3 = 2.73 \text{ amperes.}$$

(To check, $2.73 \times 77 = .3 \times 700 = 210$ watts.)

The primary current will actually be a little higher than 2.73 amperes because of magnetization current and iron losses. However transformers of this size should work at efficiencies of 90 per cent or better and for all practical purposes the current as determined above is correct.[2]

Referring to Fig. 1, the auto transformer, $T_a$, must deliver 77 volts across $AB$ at 2.73 amperes for the primary of $T_p$.

The number of turns per volt to be used on $T_a$ can be found from the formula:

$$N = \frac{1}{4.44 \times f \times B \times A \times 10^{-8}}$$

where

$f$ = frequency in cycles

$B$ = Maximum flux density, which is 50,000 lines per square inch for transformers of this size. For larger transformers, such as might be used to control the line voltage of a 500- to 1000-watt transmitter, 60,000 lines per square inch may be used.

$A$ = Cross section of the core in square inches.

For example, let us assume a core having a cross section of three square inches, which is the size of some of the larger b.c. transformers.

$$N = \frac{1}{4.44 \times 60 \times 50{,}000 \times 3 \times 10^{-8}}$$

$$= \frac{1}{13{,}310{,}000 \times 3 \times 10^{-8}}.$$

$$N = \frac{1}{0.4} = 2.5 \text{ turns per volt.}$$

Total turns on $T_a = 115 \times 2.5 = 288$ turns. Taps should be brought out for 110 and 105 volts to compensate for line voltage variations. These would be made at 275 and 263 turns respectively.

Since 77 is 67% of 115 $\left(\frac{77}{115} = .67\right)$ the number of turns in $AB$ is:

$288 \times .67 = 193$ turns, or $2.5 \times 77 = 193$ turns.

The total current delivered to the load is divided in the two sections of $T_a$ and the current in each section is inversely proportional to the turns ratio of the two sections. The current in section $BC$ is:

$$2.73 \times .67 = 1.83 \text{ amperes}$$

(*Continued on page 114*)

* Box 361, Charlottesville, Va.

[1] Blitch, "An Improved Method of Voltage Control," *QST*, August, 1936.

[2] The calculation as outlined above will be accurate only when the current figure used is the r.m.s. value, and only when the load is purely resistive. These conditions are satisfactorily met in the case of filament transformers. However, the peculiar conditions under which plate-supply transformers work modify the usual assumptions with respect to the current flowing in primary and secondary. The secondary volt-amperes can be calculated to sufficient accuracy by the formula

Sec. VA = Total $E_{rms} \times I \times 0.75$

in the case of choke-input filters (See Power Supply Chapter *The Radio Amateur's Handbook*) and in the case of condenser-input filters by the formula

Sec. VA = Total $E_{rms} \times I \times 1.11$

where Total $E_{rms}$ is the *total* secondary voltage (not simply one-half secondary) and $I$ is the d.c. load current. In small transformers it is customary to assume losses of about 10%, so that the primary VA would be about 10% higher than the secondary VA. Primary current can be calculated by dividing the primary voltage into the primary VA.

In the above example, therefore, the use of these formulas would bring about the following result, with a choke-input filter:

Sec. VA = $1400 \times 0.3 \times 0.75 = 315$ volt-amperes

Primary VA = Sec. VA + 10% = 350 VA, approx.

Primary current = $\frac{350}{115} = 3.04$ amp.

With a condenser-input filter, the resultant currents would be still larger because the factor 0.75 increases to 1.11.

# With the Affiliated Clubs

TOGETHER with all other forms of amateur radio endeavor club activities are reaching a seasonal peak. More and more organizations are bending their efforts toward the elimination of illegal operation in their areas and the establishment of reliable emergency facilities for their communities. Through well-prepared newspaper articles various clubs are bringing about a better understanding of amateur radio by the general public. A keener spirit of fraternalism is encouraged by club-sponsored state bulletins, hamfests, QSO parties, contests, etc.

In South Dakota the Miller Amateur Radio Club publishes a paper, "The Transmitter," which is mailed to every amateur in the Dakotas. This club is also originator of the fraternity "Kadosmah" of which there are now some 350 members. . . . The Tri-States Radio Club of Port Jervis, N. Y., completed a club house and is now comfortably situated in its new quarters. . . . Robert C. Lydon, W8KSY, Secretary-Treasurer of the Detroit Amateur Radio Association, writes, "With high hopes we are planning a program of fun and service which shall encompass those phases of amateur communication which have proven of sound value and the mainstay for so long in this, the most fascinating of hobbies. A 'one spot net' using 3656 kc. has been established by the Association in Lower Michigan, and traffic is moving through our state freely and fast from origin to destination." . . . The D.A.R.A. has published a monthly bulletin for five consecutive years. . . . Beginners in St. Louis, Mo., have a real friend in the Mound City Radio Amateurs. This club has two rooms in the Sherman Park Community Center, a city institution—one room is used as a class room where free instruction is given under club auspices; the other room is the club room, where a 500-watt c.w. rig and 250-watt 'phone rig is in operation on 3.5, 7 and 14 Mc. under the call W9YMA. Several hundreds of fellows between 14 and 18 years of age are being helped by this club's efforts. . . .

—···—

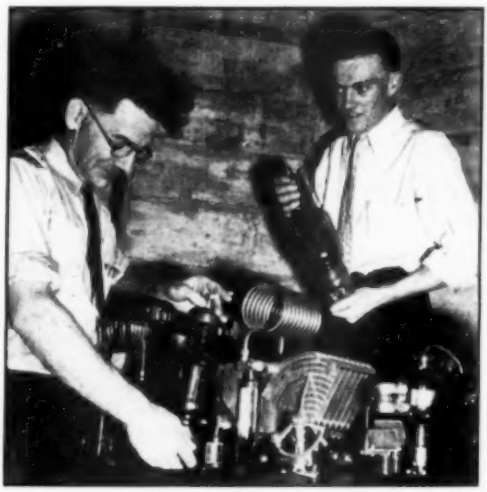
## W6SV

By Richard F. Barrett, W6CFK

THE Santa Clara County Amateur Radio Association of San Jose, Calif., is preparing for increased public service and at the same time perpetuating the name of its most distinguished member, the late Col. Clair Foster, W6HM.

When the Colonel closed his shack in the summer of 1935 for his annual vacation trip to British Columbia it was for the last time. In October death found him at Denver, Colo., where he had rushed when stricken ill as he prepared to return home. As his friends recovered from the shock of his death, it became a natural speculation as to what would be done with the expensive equipment, which, sending out impulses from the shack among the pines of Carmel-by-the-Sea, had made the colonel's vigorous personality known the world over. Then, through Ralph Heintz, W6XBB, of Heintz & Kaufman, San Francisco, good friend of the Colonel, it was learned that Mrs. Foster desired to give to his home club, The Santa Clara County Amateur Radio Association, not only HM's radio equipment but all the curios he had collected as a result of his widespread operation.

The club was gratified but stumped by the need of a place to house the gift, having no regular rooms of its own. Inquiries were launched.



*W6IXJ AND W6NRG ABOUT TO FIRE UP THE W6HM RIG AT ITS NEW LOCATION SIGNING W6SV*

The place that seemed most obvious was the city's new Municipal Auditorium, an earthquake-proof structure completed last spring after an expenditure of approximately $675,000. In designing the building the architect had provided a copper-covered tower near the southeast corner for two reasons: first, to provide an outlet for the main exhaust fan and second, to balance the stage loft at the rear, giving the California-Spanish style structure dynamic symmetry, as he called it. After the fan was installed below and the motor to run it, there was ample empty space remaining. Like a famed Mormon leader

*(Continued on page 102)*

# Testing Transmitting Tubes

## A Practical Method of Checking the Emission of Doubtful Bottles

By T. M. Ferrill,* W5CJB

THE heart of a transmitter is the vacuum tube, and the heart of the vacuum tube is the cathode—in the case of the medium and high power tubes, the filament. The efficiency and output of an amplifier or oscillator stage is directly dependent on the condition of the tube filaments. A new transmitting tube has a filament which, when heated to operating temperature by the application of its rated voltage, emits electrons at an adequate rate for the proper operation of the tube. An old tube—that is, one which has been operated from several hundred hours to a thousand hours or more, perhaps to the full life of the tube—may have the same appearance when properly heated as the similar new tube. It allows a plate current to pass, although it may not be as large a current as in a new tube.

The average amateur is not so fortunate as to have a spare set of expensive new tubes similar to those in his transmitter; hence it is seldom convenient to compare new tubes with those in use to determine their condition and efficiency. He may assume that the tube in the r.f. final amplifier of his transmitter is operating as efficiently as it should, when in reality he is having to drive the stage harder and use more plate voltage to get as much current to flow in the plate circuit than he would with a normal tube. The efficiency of the stage is much lower than it should be. Many amateurs purchase used tubes, thinking that they are making a large saving, when actually the tubes have filament emission far below the normal value for the particular type, their useful life having already been spent, making them almost completely worthless. Many amateurs have had the misfortune to purchase a used transmitting tube, building at considerable expenditure of time and expense a transmitter designed specifically to make use of the tube, only to find it has been worn out by long use or improper operation. Since it is impossible to determine the condition of a tube by simply making a continuity test of the filament, and since it is often too inconvenient or nearly impossible for an owner to test his transmitting tubes by comparison with new tubes or by operating the tubes in another transmitter in such a way as to determine accurately their condition and reliability, it is the purpose of this discussion to point out a method of testing transmitting tubes.

It is usually convenient to test small tubes—those up to and including the Type 210—in tube checkers designed for receiving tubes. For larger types of tubes used in transmission, however, other means must be resorted to. In making this test, the filament must first have its rated voltage applied at the filament terminals, for which purpose either a battery with a rheostat or a variable source of a.c. voltage must be obtainable, together with a suitable voltmeter connected at the terminals of the tube for adjusting the voltage under load to the rated value. Other essentials for proper testing include a source of known d.c. potential applied to the grid and so arranged that the grid may be made positive, zero potential, or negative, with respect to filament; a source of plate current at variable voltages; and means for measuring the various voltages and the plate current. In addition, provision should be made for applying such potentials as are required to the screens of tetrodes and pentodes. A basic diagram of the arrangement applied to a triode is shown in Fig. 1.

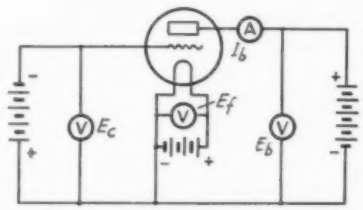



*FIG. 1—A SIMPLE CIRCUIT FOR TUBE TESTING*

The plate current which should result from the application of a number of fixed grid potentials and any plate voltage (under load) can easily and quickly be found by referring to the family of plate-characteristic curves obtainable from tube-manufacturers for the different types of transmitting tubes in common use. By testing the tube at two widely different grid voltages, it is easy to determine whether the grid properly controls the plate-current flow. This eliminates the possibility that the emission seems large in the first trial as a result of the tube being gaseous.

One interesting phenomenon which has probably troubled a large number of amateurs and other operators results from the use of a rather questionable tube in a newly built transmitter. Having already tested the oscillator and all the intermediate power amplifiers, the operator pro-

*State College, Miss.

ceeds to apply the plate voltage to the final amplifier, which contains the questionable tube, and finds the plate current proper, in resonance and out, loaded and unloaded; but upon allowing the stage to operate for several minutes with the final stage using medium plate current, it is found that the current gradually decreases, until the current

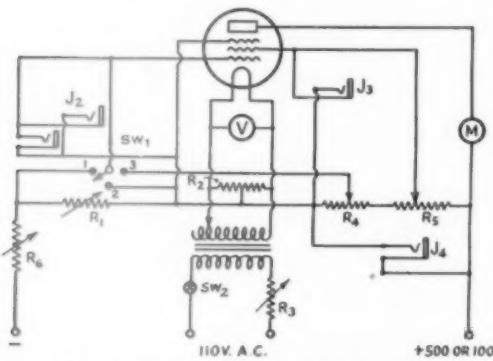



*FIG. 2—A PRACTICAL TEST CIRCUIT FOR TRIODE AND MULTI-ELEMENT TRANSMITTING TUBES*

*$R_1$—1000-ohm variable or tapped resistor.*
*$R_2$—100-ohm center-tapped resistor.*
*$R_3$—40-ohm variable resistor.*
*$R_4$, $R_5$—Values and watt-ratings dependent on range of tubes.*
*$R_6$—50-watt semi-variable, 4000-ohm.*
*$Sw_1$—3-point tap switch.*
*$Sw_2$—S.p.s.t. power switch.*
*V—0-15 a.c. voltmeter.*
*M—0-200 or 0-300 d.c. milliammeter, depending on tube plate current rating.*
*$J_1$, $J_2$, $J_3$, $J_4$—Jacks for d.c. voltmeter.*
*Note: $J_3$ and $R_5$ may be omitted if only triodes are to be tested.*

at which it stops decreasing and remains constant is but a fraction of the original plate current which seemed proper. The natural assumption of the operator is that he has made some serious error in the design or construction of the amplifier, and that as a result the tube has been seriously injured. A simple explanation of this behavior is as follows: While working on the preceding stages, making the little changes and adjustments which are necessary to make the finished product give best results, the final tube has been in place, operating with filament power applied. The cumulative effect of these heatings of the filament with no plate or grid voltage application is a very temporary rejuvenation of the tube filament to normal activity, so that when the plate voltage is first applied to the tube, it operates just as a good tube would. A tube of extremely low emission which is "at the end of its trail" may be restored to normal activity by the application overnight of filament voltage only. Its restored emission is very temporary, however, and a plate current of constant voltage and medium intensity flowing through the tube only a few minutes will reduce the filament to its low-emission state. Since this is true, a complete test for large tubes should include a prolonged, medium-intensity plate current flow which will cause a tell-tale reduction of emission if the tube is worn out.

A testing arrangement applicable to almost any transmitting triode, tetrode, or screen-grid pentode, is shown diagrammed in Fig. 2. A small, tapped-secondary transformer, designed for use with toy electric trains, is a very convenient source of filament voltage, as the usual type is provided with a tapping and switching arrangement which provides voltages up to 15 in very small steps, and is rated at 75 to 100 watts. Heating the tubes with direct current from a battery is too expensive and inconvenient; hence the use of a.c. transformer filament supply. Any type of filament transformer of adequate power and voltage may be used if it is provided with suitable means of adjusting the voltage applied through a satisfactory range. Ratings of resistors and ranges of volt meters used in the circuit of Fig. 2 are not all given, since there is such a wide range of individual needs, different amateurs having entirely different sizes of tubes. Naturally, the larger the tubes to be checked, the more expensive suitable resistors will be, since higher heat dissipation in the resistors will result.

In Fig. 2, $Sw_1$ is a single-pole three-position switch for applying a negative, zero, or positive potential to the control grid. In position 1, the grid is negatively charged and the grid voltage is varied by means of $R_1$; in position 2, the grid potential is zero; and in position 3, the grid is positively charged and its voltage is adjusted by means of $R_4$. If the tester uses a.c. filament supply as shown, and grid-return connections are made to the electrical center in the filament circuit, add $(+)\ \frac{\text{filament voltage}}{2}$ to the grid voltage specified in a family of plate-curves, *if* the voltage applied to the filament in making the curves was d.c.

The apparatus shown in Fig. 2 is shown connected to a five-element tube. When a tube with fewer grids is tested, the respective grid connections are simply left open at the tube socket.

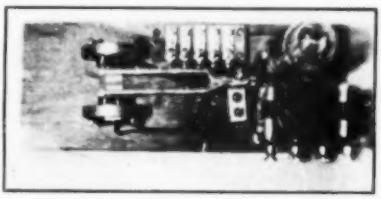
Take the Type 860 tube as an example, and begin by referring to all obtainable data on the tube. Install the tube in the tester and adjust the voltage on the filament to 10 volts, allowing the tube 15 or 20 seconds to reach a normal filament temperature. Now, from the graph of a family of plate-characteristic curves, it is found that 500 volts is applied to the screen, and this voltage will accordingly be used in each of the trials made in testing the tube. Next, it is found that with a control grid voltage of +25, the plate current should be 100 ma. when 800 volts are applied to the plate. By a simple application of Ohm's Law, we find that the plate dissipation under these conditions would be 80 watts, a safe power for this

*(Continued on page 118)*

# A Tuning-Fork Tone Generator of Simple Construction

By Charles W. Carter,* W3EZL

THE tone generator to be described generates a sine wave of constant frequency. Primarily this particular one was made with the idea of feeding the output directly into the microphone circuit of a radiotelephone transmitter for the purpose of making adjustments through the various stages while checking the r.f. output with an oscilloscope. It was also desired as a source of standard frequency for determining unknown frequencies by the Lissajous figure method. The generator very successfully performs these two functions.



THE TUNING-FORK OSCILLATOR ASSEMBLY

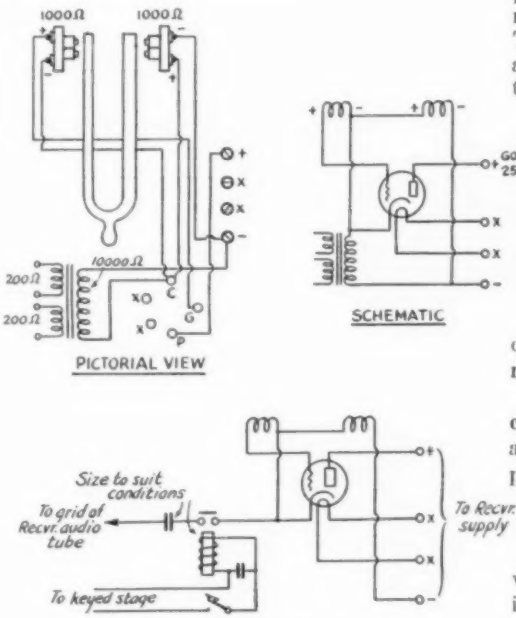



FIG. 1—CIRCUIT DETAILS OF THE TONE GENERATOR

Some of the other uses suggested for this type of generator are: Frequency generator for a capacity bridge; source of tone for m.c.w. work (keying may be done in the output circuit.) It also makes a nice note to listen to when keying a c.w. transmitter. However, I know of no way to adapt it for this work without the use of a relay. A typical circuit arrangement is shown.

The tone generator makes use of a tuning fork as a source of steady frequency. The idea is very old and, in more expensive forms, is used in many laboratories. The low cost and ease of construction have not been brought to the attention of the amateur and this probably accounts for the lack of use of the instrument.

The tuning fork is a 5th octave *C* having a pitch of 523.3 cycles and can be purchased from most large music dealers for seventy-five cents. The fork is rigidly mounted by means of heavy angle clips to a hardwood base. On either side of the fork at the open end is mounted a head 'phone which constitute grid-circuit and plate-circuit electromagnets. These 'phones are of the dollar variety with a thin aluminum case. The threaded part of the case has been cut off to allow the pole pieces to project. The clearance between the pole pieces and the fork is slightly less than $\frac{1}{16}$ inch. When connected as shown in the diagram of Fig. 1, any type of triode tube can be used with success. The output transformer is an ancient two-button microphone transformer.

Vibration of the fork prong nearest the grid circuit electromagnet produces e.m.f. which is amplified by the tube and, in turn, results in plate circuit reaction which sustains oscillation at a rate determined by the pitch of the tuning fork.

The tuning fork is usually self-starting in this location, probably because of ever-present vibrations from heavy traffic nearby; however, it may be necessary to strike it lightly to start it in other locations. Seven seconds are required for the volume to reach full intensity. Very little audible sound is made and when running with low plate voltage, it may be inaudible to the ear direct. In order to generate the purest wave form, the plate supply should be either from batteries or from a well filtered rectifier supply. The plate voltage should be as low as is consistent with the desired volume.

*808 Prince St., Alexandria, Va.

# Amateur Radio STATIONS

## W8POQ, Cleveland, Ohio

W8POQ is owned and operated by Ralph K. (Bunny) Rex, Chairman of the Board of Directors of The Diebold Safe and Lock Company of Canton, Ohio. The station is located at the Rex residence in Cleveland, Ohio.

The owner's interest in amateur radio goes back to the early days when Bunny Rex, with his

*W8POQ*

collection of spark coils, tuners and coherers, was one of the few local amateurs competing with the commercial stations for supremacy of the ether.

The press of business submerged his amateur activities, but the radio bug apparently had bit deeply, for in 1936 Mr. Rex, in conjunction with Mr. Lear of The Lear Development Laboratories, designed his present transmitter for his yacht at Miami, Florida.

Space being an important consideration in the design, the entire transmitter including power supplies and an HRO receiver is mounted in a cabinet thirty inches high, twenty inches wide and fifteen inches deep.

The r.f. section consists of a 6A6 crystal oscillator and harmonic generator, one 6A6 for additional harmonic generation on higher frequencies, a single 59 buffer amplifier driving an RK-28, suppressor-grid modulated. Ten crystals supply a total of twenty-eight frequencies on four bands on a minute's notice. Interlocked switches with pretuned tank circuits take care of this problem nicely.

The audio section comprises a 6A6, pentode connected, which is resistance coupled to a 6B5 modulator suitably coupled to the suppressor grid circuit of the RK-28.

Relays are provided for quick break-in operation with the well known push-to-talk method being used.

At the time this is being written plans are under way for a new one kilowatt transmitter of the very latest design. It is rumored that the new transmitter will switch bands at the snap of the fingers.

—*W8FHE*

—···—

## W2EVV, Jackson Heights, Long Island

SAYS Perry Driggs, W2EVV, "New York City hams are not only faced with b.c.l. trouble but with the space problem as well." How he has solved the last part of it is shown in the accom-

**W2EVV**

panying photographs. It strikes us as being a pretty snappy arrangement for the station which must be concealed in a living room.

The cabinet houses everything—receiver,

transmitter, modulator, and two power supplies. It was home-made for the purpose, having doors opening to permit the operator to get at the transmitter, and a hinged panel which serves as an operating desk when not closed up to conceal the receiver. To make the cabinet harmonize with its surroundings, it was given a coat of white enamel, then antiqued with burnt umber.

*W2EVV? WHO WOULD GUESS IT?*

The trim is unfinished black walnut. Dimensions are 38 inches high, 24 inches wide, and 15 inches deep.

As for the equipment itself, the transmitter consists of a 47 oscillator, 46 doubler, and two 46's in parallel in the final. The speech end includes a double-button mike working into a 58 resistance-coupled to a 46, which in turn drives two 46's in Class-B. Separate 400-volt power supplies are used for the r.f. and audio ends. R.f. power output is about 25 watts. A voltage-fed Hertz antenna is used. The receiver is a Hammarlund Comet Pro.

The rig has been on the air only a short time, since the present location is of recent acquisition. W2EVV formerly operated a similar 46 rig on 160-meter 'phone and a 100-watt job on 40- and 20-meter c.w. when the station was located at Bayside, Long Island, where considerably more space was available.

—···—

## W6NZ, San Francisco, Calif.

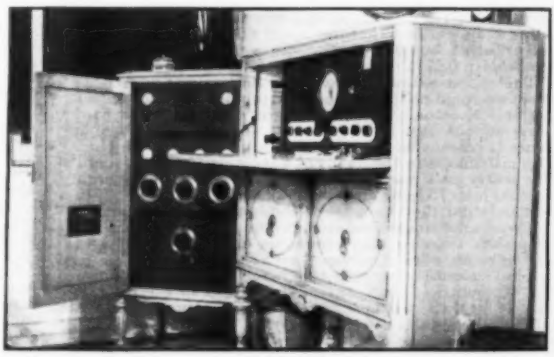
THIS business of making radio apparatus blend in with furniture apparently is getting a good deal of amateur attention these days. W6NZ, owned by Sydney J. Fass, San Francisco, is an excellent example of the way the station can be dressed attractively. Such a rig should pass the inspection of the most critical of XYL's.

W6NZ has separate cabinets for receiver and transmitter, reconstructed from b.c.l. cabinets of 1926 vintage and painted antique ivory to match the other furniture in the room. This is a good tip for others who have no liking for building their own—these cabinets can be purchased quite cheaply nowadays and are remodelled easily.

The transmitter, built on a metal rack with metal panels, has a 47 oscillator and RK-20 amplifier, using the circuit given in August, 1935, *QST*. The oscillator and amplifier occupy the middle section. Behind the lower panel is the power-supply equipment, giving 400 volts for the oscillator and 1000 for the amplifier. The top panel contains antenna-tuning apparatus. The transmitter works on 3.5 and 7 Mc. with several crystals; bands and crystals are switched from the front of the panel. The input to the RK-20 is 100 watts.

The receiver is an ACR-175, equipped with a Lamb noise silencer. The latter, incidentally, takes out the racket from the transmitter so effectively that noiseless break-in is possible even on the transmitting frequency. A doublet antenna, 33 feet on each side, has been found to be very satisfactory for reception on all frequencies.

W6NZ has been associated with radio for a long time: amateur from 1909 to 1911, commercial operator from 1911 to 1917, in Navy during the War, with many crossings to Europe on cargo and troop transports, resumed amateur radio in 1924 and has been active ever since. He has been in the Naval Reserve since 1925, and holds the rank of lieutenant. A good deal of the station activity is in connection with N.C.R. work.



*W6NZ*

W6NZ also has been Radio Chairman for Navy Day for the 12th Naval District for the past three years.

The station is located on top of Telegraph Hill, one of San Francisco's highest spots, and overlooks the Golden Gate.

## Strays

### Bound Volume XX of *QST*

We have a limited number of Bound Volume XX of *QST*. This volume is made up in two sections, each containing six issues of 1936 *QST*. Handsomely bound and gold imprinted the complete volume is priced at $5.00, postpaid.

# • I. A. R. U. NEWS •

Devoted to the interests and activities of the

## INTERNATIONAL AMATEUR RADIO UNION

*Headquarters Society:* THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

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Union Schweiz Kurawellen Amateure
Wireless Institute of Australia

## *Countries:*

This department is going to overrun its allotted space this month, anyway, so we haven't much time for introductory comment. We suggest you turn to page 40 of the October, 1935, issue of *QST* for the background (it was a piece called "How to Count Countries Worked," you may remember).

Yes, that's the subject. "How to count countries worked. . . ." In that discussion we set forth how ordinary counting methods led one into no end of trouble, and then set forth a more or less simple rule for arriving at a total figure for legitimate countries worked. That is, we thought it was simple. Some of the gang have since registered disagreement. Finally, we slid gracefully (?) out from under the question of actually making a *list* of all the countries of the world by citing the plain fact that one could easily reach a total of six or seven hundred—and there weren't enough pages available in *QST*!

There came a time, though, when Fate caught up to us—when we could no longer elude the problem—when we had not only to actually list the countries of the world for ham purposes but also to boil the list down to a reasonable figure (a reasonable figure being, say, a couple of hundred). The instrument in the hands of Fate which brought about this pretty pass was the new A.R.R.L. Map of the World. On that map, like any good map, countries had to be shown. Not only did they have to be shown on the map, with a different color to each country (no simple problem in itself, with sixty times as many countries as colors!), but there had to be an indexed reference list at the bottom.

The connection between this map list and an "official list of countries, etc." was obvious. It offered a perfect vehicle for the general popularization and appreciation of a suggested standard list—not a perfect list, for no such list could be perfect, since inevitably there will be different persons who will be dissatisfied with different aspects of it—but at least a generally-recognized standard to which everyone could refer and use as a start for further argument.

And so we present to you not an "official list of countries," since "official" presumes general sanction and that can come only with time, but a list that we feel is just about as complete as could be made, fair to the DX man from the standpoint of giving credit where credit is due, and certainly a very definite starting point. Only official prefixes are included, so don't worry about the absence of "K5," "OM," etc.

We would like to help towards the acceptance of a standard of "countries worked." Our contribution follows. Your comment is invited.

| *Country* | *Prefix* |
|---|---|
| Abyssinia, see Ethiopia | |
| Aden | |
| Aegean Islands | |
| Afghanistan | YA |
| Alaska | K7 |
| Albania | ZA |
| Aldabra Islands | |
| Algeria | FA |
| Andaman Islands | |
| Andorra | |
| Anglo-Egyptian Sudan | ST |
| Angola | CR6 |
| Arabia, see Saudi Arabia | |
| Argentina | LU |
| Ascension Island | ZD8 |
| Australia | VK |
| Austria | OE |
| Azores Islands | CT2 |
| Bahama Islands | VP7 |
| Bahrein Islands | VS8 |
| Balearic Islands | EA6 |
| Baluchistan | |
| Barbados | VP6 |
| Bechuanaland | |
| Belgian Congo | ON |
| Belgium | ON |
| Bermuda Islands | VP9 |
| Bhutan | |
| Bismarck Archipelago | |
| Bolivia | CP |
| Borneo, Netherlands | PK5 |
| Brazil | PY |
| British Cameroons, see Nigeria | |
| British Honduras | VP1 |
| British North Borneo | VS4 |
| Brunei | |
| Bulgaria | LZ |
| Burma | |
| Cameroons, French | FE8 |
| Canada | VE |
| Canal Zone | |
| Canary Islands | EA8 |
| Cape Verde Islands | CR4 |
| Caroline Islands | |
| Celebes and Molucca Is. | PK6 |
| Ceylon | VS7 |
| Chile | CE |
| China | XU |
| Chosen (Korea) | J8 |
| Christmas Island | ZC3 |
| Cocos Islands | ZC2 |
| Colombia | HJ |
| Comoro Islands | |
| Cook Islands | ZK1 |
| Corsica | |
| Costa Rica | TI |
| Crete | |
| Cuba | CM-CO |
| Curacao and Netherlands West Indies | PJ |
| Cyprus | ZC4 |
| Czechoslovakia | OK |
| Danzig | YM |
| Denmark | OZ |
| Dominican Republic | HI |
| Eastern Island | |
| Ecuador | HC |
| Egypt | SU |
| Eritrea | |
| Estonia | ES |

| Country | Prefix |
|---|---|
| Ethiopia (Abyssinia) | ET |
| Faeroes, The | OY |
| Falkland Islands | VP8 |
| Fanning Island | VR3 |
| Federated Malay States | VS2 |
| Fiji Islands | VR2 |
| Finland | OH |
| Formosa, see Taiwan | |
| France | F |
| French Cameroons, see Cameroons | |
| French Equatorial Africa | FQ8 |
| French Indochina | FI8 |
| French Oceania | FO8 |
| French West Africa | FF8 |
| Galapagos Islands | |
| Gambia | ZD3 |
| Germany | D |
| Gibraltar | ZB2 |
| Gilbert & Ellice Islands and Ocean Island | VR1 |
| Goa | CR8 |
| Gold Coast (and British Togoland) | ZD4 |
| Gough Island | |
| Great Britain | G |
| Greece | SV |
| Greenland | OX |
| Guadaloupe | FG8 |
| Guam | K6 |
| Guatemala | TG |
| Guiana, British | VP3 |
| Guiana, Neth. (Surinam) | PZ |
| Guiana, French, and Inini | FY8 |
| Guinea, Portuguese | CR5 |
| Guinea, Spanish | |
| Haiti | HH |
| Hawaiian Islands | K6 |
| Hejaz | HZ |
| Honduras | HR |
| Hong Kong | VS6 |
| Hungary | HA |
| Iceland | TF |
| Ifni | |
| India | VU |
| Inini, see Guiana, French | |
| Iran (Persia) | EP |
| Iraq | YI |
| Ireland, Northern | GI |
| Irish Free State | EI |
| Italy | I |
| Jamaica and Cayman Islands | VP5 |
| Japan | J |
| Java | PK |
| Kenya | VQ4 |
| Kerguelen Islands | |
| Korea, see Chosen | |
| Laccadive Islands | |
| Latvia | YL |
| Leeward Islands | VP2 |
| Liberia | EL |
| Libya | |
| Liechtenstein | |
| Lithuania | LY |
| Luxembourg | LX |
| Macau | CR9 |
| Madagascar | FB8 |
| Madeira Islands | CT3 |
| Maldive Islands | VS9 |
| Malta | ZB1 |
| Manchukuo | |
| Marianas Islands | |
| Marshall Islands | |
| Martinique | FM8 |
| Mauritius | VQ8 |
| Mesopotamia, see Iraq | |
| Mexico | XE |
| Midway Island | K6 |
| Miquelon & St. Pierre Islands | FP8 |
| Monaco | |
| Mongolia | |
| Morocco, French | CN |
| Morocco, Spanish | EA9 |
| Mozambique | CR7 |
| Nepal | |
| Netherlands | PA |
| Netherlands West Indies, see Curacao | |
| New Caledonia | FK8 |
| Newfoundland and Labrador | VO |
| New Guinea, Neth. | PK6 |
| New Guinea, Territory of | VK9 |
| New Hebrides, British | YJ |
| New Hebrides, French | FU8 |
| New Zealand | ZL |

| Country | Prefix |
|---|---|
| Nicaragua | YN |
| Nicobar Islands | |
| Nigeria (British Cameroons) | ZD2 |
| Niue | ZK2 |
| Non-Federated Malay States | VS3 |
| North Borneo, see British North Borneo | |
| Norway | LA |
| Nyasaland | ZD6 |
| Ocean Island, see Gilbert & Ellice Islands | |
| Oman | |
| Palau (Pelew) Islands | |
| Palestine | ZC6 |
| Panama | HP |
| Papua Territory | VK4 |
| Paraguay | ZP |
| Persia, see Iran | |
| Peru | OA |
| Philippine Islands | KA |
| Phoenix Islands | |
| Pitcairn Island | VR6 |
| Poland | SP |
| Portugal | CT |
| Portuguese India, see Goa | |
| Principe & Sao Thome Islands | |
| Puerto Rico and Virgin Islands | K4 |
| Reunion Island | FR8 |
| Rhodesia, Northern | VQ2 |
| Rhodesia, Southern | ZE |
| Rio de Oro | |
| Roumania | YR |
| St. Helena | ZD7 |
| Salvador | YS |
| Sardinia | |
| Samoa, U. S. | K6 |
| Samoa, Western | ZM |
| Sandwich Islands | |
| Sarawak | VS5 |
| Saudi Arabia | |
| Seychelles | VQ9 |
| Siam | HS |
| Sierra Leone | ZD1 |
| Socotra | |
| Solomon Islands | VR4 |
| Somaliland, British | VQ6 |
| Somaliland, French | FL8 |
| Somaliland, Italian | |
| South Georgia | VP8 |
| South Orkney Islands | VP8 |
| South Shetland Islands | VP8 |
| Southwest Africa, see Union of South Africa | |
| Soviet Union | U |
| European States | U1-7 |
| Asiatic States | U8-9-0 |
| Spain | EA |
| Spitzbergen, see Svalbard | |
| Straits Settlements | VS1 |
| Sumatra | PK4 |
| Surinam, see Guiana, Neth. | |
| Svalbard (Spitzbergen) | |
| Sweden | SM |
| Switzerland | HB |
| Syria | |
| Taiwan (Formosa) | J9 |
| Tanganyika Territory | VQ3 |
| Tangier Zone | |
| Tannu Tuva | |
| Tasmania | VK7 |
| Tibet | |
| Timor, Portuguese | CR10 |
| Togoland, British, see Gold Coast | |
| Togoland, French | FD8 |
| Tokelau (Union) Islands | |
| Tonga (Friendly) Islands | VR5 |
| Transjordan | ZC1 |
| Trinidad and Tobago | VP4 |
| Tristan de Cunha | ZU9 |
| Tunisia | FT4 |
| Turkey | TA |
| Uganda | VQ5 |
| Union Islands, see Tokelau Islands | |
| Union of South Africa | ZS-ZT-ZU |
| United States | W (N) |
| Uruguay | CX |
| Venezuela | YV |
| Virgin Islands, see Puerto Rico | |
| Wake Island | K6 |
| Windward Islands (Grenada) | VP2 |
| Wrangel Island | |
| Yemen | |
| Yugoslavia | YT-YU |
| Zanzibar | VK1 |

# HINTS and KINKS
## for the Experimenter

### Note on Decoupling Circuits
By Franklin Offner, W9FTO

CIRCUIT decoupling has caused many designers and builders of amplifiers considerable trouble. The author himself had not a little grief with one particular circuit, and as we know several others having had the same trouble, we feel a few words on the subject might be valuable. This is especially true as the circuit has appeared in most technical radio publications. To get down to cases, the guilty circuit is that shown in Fig. 1-A. The so-called "decoupling network," composed of $R_d$ and $C_d$, is supposed to keep the grid

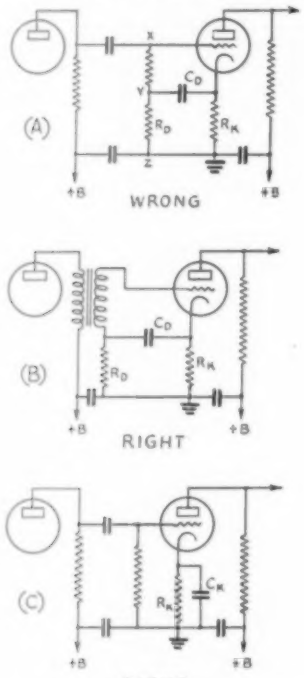


*FIG. 1—THE WRONG AND RIGHT OF DECOUPLING CIRCUITS*

bias constant over an audio cycle and, by this filtering out of the voltage appearing across $R_k$, prevent degeneration. To this end, the product $R_dC_d$ is made large compared to the period of the lowest frequency to be passed, and as $R_d$ may be made large, a fairly small capacity is supposed to suffice at $C_d$. We built an amplifier using this circuit, and were quite chagrined to find that there was no noticeable effect upon removing $C_d$ completely! Then the light dawned. Although the network evidently keeps point *Y* (Fig. 1-A) at cathode potential (for a.c.), to avoid degeneration we must *apply the signal* between the grid and a point at cathode potential—but here the signal is being applied between *X* and *Z*, and *Z* has the whole degenerative voltage developed across $R_k$ between it and the cathode. (Anyone not satisfied with this proof can work out the circuit equation, which will be found to give the same result.) If the signal were applied between *X* and *Z*, everything would be fine, but to accomplish this, we must use transformer coupling (Fig. 1-B). However, if we wish to keep resistance coupling and cathode resistor bias we must by-pass $R_k$ directly, as at Fig. 1-C. $C_k$ should be large enough to keep the cathode at ground a.c. potential, for the signal is effectively being applied between grid and ground. In general, 5 to 25 μfd. is adequate for good low-frequency response in audio amplifiers, depending upon the value of resistance used at $R_k$.

—···—

### An Impedance Bridge

FIG. 2 is the circuit of an impedance bridge which I am sure many a ham would be able to use. I use it myself for balancing up *LC* circuits in the r.f. stages of receivers and for many similar purposes. The idea is to make up, say, the antenna coil and r.f. coupling coil of a short-wave super and connect one to each end of the bridge. If or when the inductances are equal there is no reading on the vacuum-tube voltmeter. Ganged condensers can be treated in the same way and checked right over their full scale. It is surprising what can be done in a tracking stunt like this. I have a super lined up with two r.f. stages and if you bend a grid lead out of shape it affects the a.v.c. meter.

A good method of checking is to use two resistances, one of 1000 ohms, fixed, and one variable of 1500 ohms. Connect the 1000-ohm standard to one pair of terminals (as 1 and 2) and the variable to the other pair; then find the point of balance on the 1500-ohm variable. Then if these are connected in series with the coils, condensers or resistors to be matched, you can tell at once whether it is a case of "too much or too little."

But before any measurements are made the bridge itself *must be balanced exactly*. This can be done by shorting terminals 1 and 2 together and 3 and 4 together. Make all coils alike and bring

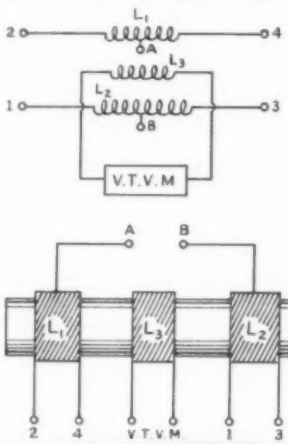


*FIG. 2—AN IMPEDANCE BRIDGE USEFUL FOR MATCHING COILS AND OTHER MEASUREMENT PURPOSES*

*$L_1$ and $L_2$ are each 30 microhenrys, centertapped; $L_3$ is the same without the center-tap. Various coil dimensions to give an inductance of 30 microhenrys can be secured by reference to the Lightning Calculator, Type A. For one-inch diameter tubing, a 30-uh. coil will have 32 turns of No. 30 d.s.c. or s.c.c. wire. It is advantageous to keep the coils small in the interests of maintaining circuit balance.*

the circuit to balance by adjusting the coupling. The layout and leads should be as symmetrical as possible; a suggested arrangement is shown in the lower part of the drawing. The frequency I use, applied between terminals A and B, is approximately 500 kc. Don't forget body capacity when using the bridge. View it from a distance.

—*Maurice J. Kirk,*
*Jamestown, S. Aust.*

## Twisting Heavy Guy Wires

THE business of twisting guy wires on to egg and antenna insulators becomes a tedious and difficult process when the wire size is large,

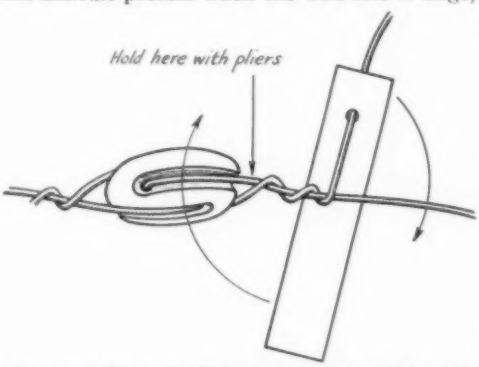


*FIG. 3—USING A SIMPLE LEVER FOR TWISTING HEAVY GUY WIRES*

as in the case with some of the high masts now in vogue. A labor- and time-saving device that is as simple as it is useful can be made from a piece of heavy iron or steel with a single hole, about twice the diameter of the wire, drilled about a half-inch in from one end. The wire is passed through the insulator, given a single turn by hand, and then held with a pair of pliers at the point shown in Fig. 3. By passing the wire through the hole in the iron, and rotating the iron as shown, the wire is quickly and neatly twisted, resulting in a junction that will satisfy the most meticulous.

—*W1JPE*

## Audio Oscillator Keying Monitor Without Relays

SOME months ago an audio oscillator powered from and keyed with the crystal oscillator was described in these pages. A somewhat similar scheme, but adaptable to any keyed stage in the transmitter, has been suggested by Frank Clark White, W8GPF. He writes:

"The advantages of listening to an audio note which is keyed at the same time the transmitter

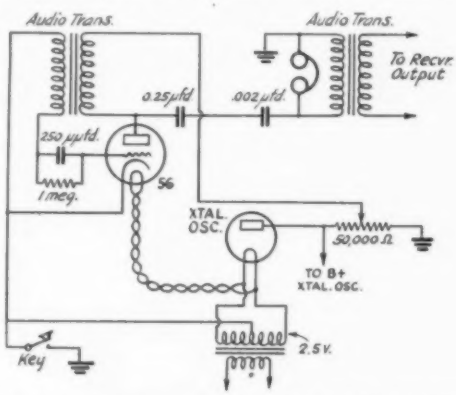


*FIG. 4—AN AUDIO OSCILLATOR FOR KEYING MONITORING WHICH CAN BE KEYED WITHOUT RELAYS SIMULTANEOUSLY WITH THE TRANSMITTER*

*Practically any type of interstage audio transformer can be used. The tone of the oscillator can be varied to some extent by changing the value of the grid condenser or leak.*

is keyed have been pointed out by many operators. For the ham who is just getting used to his mechanical key or the old-timer who sends at high speed and likes to hear his sending ripple in his ear, the system has universal appeal. In all of the *QST* articles I have read on this subject most fellows have approached the subject by using two 'phone jacks, one for the audio oscillator output and one for receiver output. Variations of this are the d.p.d.t. switch which shifts the cans from the audio oscillator to the receiver, and so on. One good system employed spare contacts on the keying relay which shifted the 'phones from one

output circuit to the other. In the composite transmitter of the Goodyear Tire and Rubber Company at Wingfoot Lake our chief engineer, Mr. Birdsall, approached what I would call the utopian in this problem of what commercial radio calls 'howlers or side tones.' A keyed audio note is dumped into the 'phones when you are sending without having to touch a switch. It works in all cases. Those who cut the plate power on their receivers or those who use break-in operation can use this system.

"As shown in the diagram, Fig. 4, the audio oscillator employs a 56 which is keyed in the cathode circuit. The cathode lead is connected to the side of the key which is intermittently grounded as you key the center tap of your transmitter. The output of the 56 is fed through a 0.25-$\mu$fd. condenser to the audio trapsformer, which can be any old audio transformer which does not attenuate the output from your receiver too much. None of the circuit constants are critical and the plate voltage of the 56 as well as the filament voltage can be obtained by tapping into the crystal oscillator stage."

It can be observed readily from the diagram that the audio oscillator can be connected to any keyed stage so long as the power supply for that stage has a bleeder from which a suitably low voltage can be tapped.

—···—

## Kink for Soldering Coil Prongs

SOLDERING wires in coil form pins is one of those jobs we like least to do, one of the reasons being that it's usually hard to make the solder stick to the pin unless the latter is heated almost to the point where it softens the form, a second being the fact that excess solder and rosin have to be scraped off afterwards. Fig. 5 shows how a simple "alteration" can be made to a soldering iron to simplify the process considerably. A hole about twice the diameter of the pin and about $\frac{3}{16}$-inch deep is drilled in the copper

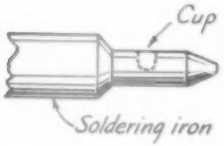


*FIG. 5—DRILLING THE SOLDERING IRON FOR SOLDERING COIL PRONGS*

point. This is then filled with solder. When coil prongs are to be soldered, the iron is fastened horizontally in a vice, the prongs given just a touch of flux and then dipped in for a second until the solder bites in. The wire should be clipped off rather short, leaving about a sixteenth inch projecting from the pin, before soldering. After the job has cooled a little so that the solder has set, the excess flux can be wiped off with a rag wet with alcohol.

One tip—the iron should be big enough so that the solder in the cup will be good and hot. If the iron is too small, a scum will form over the surface and some of it may collect on the outside of the pin.

The suggestion comes from W1HRX.

## A.R.R.L. QSL Bureau

FOR the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine U. S. and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 8 *stamped* envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and *your station call should be printed prominently in the upper left-hand corner.*

W1—J. T. Steiger, W1BGY, 35 Call Street, Willimansett, Mass.

W2—H. W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.

W3—R. E. Macomber, W3CZE, 418 10th St., N. W., Washington, D. C.

W4—B. W. Benning, W4CBY, 520 Whiteford Ave., Atlanta, Ga.

W5—E. H. Treadaway, W5DKR, 2749 Myrtle St., New Orleans, La.

W6—D. Cason Mast, W6KHV, 423 East E Street, Ontario, Calif.

W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.

W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.

W9—George Dammann, W9JO, 319 Sherman Ave., Evanston, Ill.

VE1—J. E. Roue, VE1FB, 84 Spring Garden Rd., Halifax, N. S.

VE2—W. H. Oke, VE2AH, 5184 Mountain Sights Ave., N. D. G., Montreal, P. Q.

VE3—Bert Knowles, VE3QB, Lanark, Ont.

VE4—Dr. J. J. Dobry, VE4DR, Killam, Alberta.

VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.

K4—F. McCown, K4RJ, Family Court 7, Santurce, Puerto Rico.

K5—John J. Carr, K5AV, 78th Pursuit Squadron, Albrook Field, Canal Zone.

K6—James F. Pa, K6LBH, 1416D Lunalilo St., Honolulu, T. H.

K7—Frank P. Barnes, K7DVF, Box 297, Wrangell, Alaska.

KA—George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.

# OPERATING NEWS

**Conducted by the Communications Department**

**F. E. Handy, Communications Manager** — **E. L. Battey, Asst. Communications Manager**

FLASH! A.R.R.L. Official 'Phone Station W6ITH, operated by D. R. Tibbetts in the East Bay Section worked all 69 Sections in the League's Field Organization on 'phone in the short space of two week ends in the recent "S.S."!!!!!!! 223 stations were contacted in 69 Sections (including Alaska, P.I., Hawaii, etc.) making 30,774 points in 35 hours work, with 1,000 watts power. W6ITH found the different 'phone bands useful in the following order for making this record 'phone performance:

| | | |
|---|---|---|
| 28 | Mc. | 111 contacts |
| 14 | Mc. | 46 contacts |
| 3.9 | Mc. | 38 contacts |
| 1.9 | Mc. | 14 contacts |
| 56 | Mc. | 14 contacts |
| 112 | Mc. | 1 contact |

**All contacts were two-way 'phone. This objective of all 69 A.R.R.L. Sections in an "SS" and O.R.S.-O.P.S. parties has been approached on c.w., but never accomplished before on either c.w. or 'phone. It took *operating* to get those SS-exchanges across. Congrats, W6ITH!**

***About message count:*** Everyone is invited to claim full credits for messages handled by amateur radio in monthly reports to A.R.R.L. SCMs, including the new "additional delivery credit" that was explained in August '36 *QST* (p. 37). Let us get this counting plan straight. The basis of A.R.R.L.'s count has always been that a message counts *one* in the total each time it is handled *by radio*. (Classify as *originated* each message you start at your station, as *delivered* each that ends its radio journey by reaching the addressee through your station, as *relayed* those received by radio and forwarded by radio counting a possible two points for each completed relay.)

An *extra* delivery credit, in addition to the above, should now be reported for all deliveries requiring an *additional* means or effort of the delivering operator, such as when a radiogram is delivered in person, by mail, telephone, messenger or other external means to an operator, station, or individual not on the premises of the delivering station. New "station activity report" forms are available to any amateur on request. Whether you handle messages or not, a report giving latest station dope, your frequency, operating hours, skeds, 'phone chews, DX, experiments, etc., will be welcomed by your SCM. A report from *every active ham*, every mid-month, is desired. Whether you are a League member or not—report, so your work can count for amateur radio. If you delivered messages for other than those manning your station, don't forget to report those, both as "deliveries" and again under "extra delivery credits."

No message should be considered as "handled" until radio acknowledgment (QSL) of same is received with full entry of handling data on the traffic for purposes of record.

***About word count and checking messages:*** Yea, bo, every message does bear a check *this* season. FB, gang. The burden of our remarks at this time will be to the effect that "what good is a message check" when they start if receiving and handling operators don't use that check and "argufy" about the count when words are noted missing! The best way to check the count with ease (and it is easy when you develop the knack) is to copy five, or ten, or fifteen words to the line, at any rate spacing them as they come, *in groups of five*. When you get to the signature it is then only necessary to glance at the number of such groups and multiply, adding any words left over, to get the check. Then when you confirm the word count, and not before, is the proper time to QSL (acknowledge or receipt for) the message, after which acknowledgment it may be counted as handled by both participating stations.

Don't hesitate to ask the sending operator about the word check. If it isn't right use of "QTB" will make it right or explain the discrepancy in short order! It adds to the fun of handling 'em to *do it right* in every such respect, too. One or two reminders about word count may be in order. (See full explanation this subject in the *Handbook* chapter on Message Handling.) Some ops have been trying to count each letter either in a call, or a standard abbreviation as one each. *Mixed figures and letters* do count that way. But not only do standard terms, sent together like a.m., p.m., o.k., FOB, NCS, ARRL, QTA and the like count as one word, but "groups of letters which are not dictionary words . . . count at the rate of five letters or fraction thereof to a word." HHCARA counts as two words. *Any* letter combinations of five characters or *less* count "one"! We note errors in some calls coming through many relays. This can be avoided by sending code words or always repeating unusual letter combinations as transmitted. For example:

Send W6LMD as either WATCH SIX LOVE MIKE DOG or W SIX LMD, IMI LMD.

But use such precautions! We got one message that should have been signed "Wightman" as W EIGHT MAN!! Hi. When numbers are in the text, count a word for *each* numeral, whether it stands for some abbreviation or not. 73 counts as two words—4321 is four words, and so on. To sum up: (1) Count by copying in groups of five as they come in. (2) Challenge checks before QSL. (3) Watch accuracy!

*Interference:* Several foreign amateur stations have been reported by the American Telephone and Telegraph Company as near the 14,440-kc. channel assigned to GBW, Rugby, England, and causing interference at different times. This 14,440-kc. channel is used extensively at this time of the year for transocean telephone service. All U.S.A. and Canadian amateurs working stations whose frequencies fall outside the 14-Mc. amateur band (most particularly those near 14,440!) are requested to advise such stations of the interference possibilities in connection with GBW. Trouble is reported also on reception of GFD, Bermuda, 10,052 kc. and LSN, Buenos Aires, 21,020 kc. Caution regarding attention to frequency observance is urged on all amateurs at this time, as we enter another season of active operating. *Checking all ham stations for possible harmonics and parasitics* is also the part of wisdom.

—*F. E. H.*

## Results, N. E. Birthday Party

Director Noble, W1BVR, A.R.R.L. New England Division, reports the following scores in the New England Birthday Party held October 10th and 11th (details on page 64, October '36 *QST*). Stations whose calls are underlined are leaders in their respective sections.

W1UE, 13,120; BFT, 9300; EOB, 7250; GME, 3900; EAO, 3500; GNF, 3230; TS, 2970; FE, 2660; IKM, 2640; IP, 2430; FSV, 2380; IEU, 1820; BVR, 1750; ABG, 1690; JMY, 1690; GKM, 1680; BEF, 1650; IIN, 1400; EMG, 1330; FFL, 1330; HYF, 1210; CTI, 990; QW, 880; JAH, 750; INF, 720; GOJ, 675; AXN, 650; IAV, 650; HKK, 620; ITI, 600; AUY, 520; SW, 495; GVV, 270; IWC, 270; IJW, 175; DIE, 150; EEY, 150; EFR, 140; CFO, 125; DLX, 100; HKY, 100; (Vermont station who forgot to give his call—72); JFV, 20; (JFN reported participation but gave no score).

Number reporting from each section: Connecticut, 16; Eastern Mass., 10; Western Mass., 5; Maine, 4; New Hampshire, 4; Vermont, 4; Rhode Island, 1. W1UE, the high scorer, contacted a total of 82 stations. At the time of his 71st QSO, ages averaged 28.5 years. Many of the fellows reported interesting instances—such as working fellows whose birthdays were the same as theirs.

## High Sweepstakes Scores

FROM the SS Contest logs already received the following "claimed scores" above 20,000 have been tabulated. A new record was established in the '36 SS by W6ITH, who worked all 69 A.R.R.L. Sections—all two-way 'phone!! W3BES appears to have established a new high QSO's-per-hour SS record. He was leading man in QSO's (563) in the 1935 SS, which was a 90-hour affair. In the 1936 40-hour contest, he worked 403 stations, a performance equal to 161% of his 1935 results (10 QSO's per hour in '36 against 6.3 per hour in '35). And now for the high claimed scores already in. W6KFC and W3BES running almost neck-and-neck for highest honors. Figures show score—stations worked—sections worked:

| | | | |
|---|---|---|---|
| W6KFC | 51708–278–62 | W7EK | 28320–236–60 |
| W3BES | 51456–403–64 | W2PY | 27864–216–43 |
| W9LLW | 47415–274–58 | W9WFV/9 | 27103–159–57 |
| W4CYC | 43828–240–61 | VE3JT | 26255–223–59 |
| W5KC | 43725–265–55 | W5CPB/5 | 26175–125–50 |
| W9RSO | 43200–240–60 | W9TJF | 25996–164–53 |
| W6HJT | 40507–254–55 | VE3AEM | 25915–222–39 |
| W1TS | 39406–211–63 | W8OKC | 25650–171–50 |
| W8KUN | 39273–247–53 | W3FTK | 25380–188–45 |
| W2HJK | 36375–243–50 | W6LCA | 25245–165–51 |
| W9ELL | 34844–281–62 | W8NLQ | 24763–184–60 |
| W4PL | 34692–207–56 | W2BXA | 24700–238–52 |
| W6ITY | 34427–198–59 | W6LDJ | 24255–148–55 |
| W1RY | 34426–195–59 | W9CFB | 24219–156–54 |
| W8AQ | 33858–257–66 | W9EGQ | 24150–161–50 |
| W9VKF | 33390–210–53 | W8FIP | 23664–204–58 |
| W1APU | 32661–191–57 | W2GUP | 23557–175–45 |
| W1INF (Hal) | 32306–281–58 | W2IOP | 23355–173–45 |
| | | W5DGP | 23166–143–54 |
| VE3ACS | 31248–187–56 | W8GQB | 22605–137–55 |
| VE4OC | 31164–186–56 | W9GIL | 22518–209–54 |
| W6ITH ('Phone) | 30074–223–69 | W8OYK | 22388–193–58 |
| | | W9PNE | 22260–140–53 |
| W9TWC | 30654–203–52 | W7CRH | 21546–127–57 |
| W4BOU | 30108–194–52 | W5DQD | 21230–193–55 |
| W9RBN | 29925–263–57 | W5CUX | 21226–134–53 |
| W9EYH | 29415–187–53 | W1ENW | 20725–171–41 |
| W9CWW | 29400–175–56 | W3ADE | 20700–150–46 |
| W1UE | 28957–215–45 | W9MGV | 20272–133–51 |
| VE3GT | 28840–191–51 | | |

Of these, the following worked over 200 stations. W3BES worked 403; W1INF (Hal) and W9ELL each worked 281, W6KFC 278, W9LLW 274, W5KC 265, W9RBN 263, W8AQ 257, W6HJT 254, W8KUN 247, W2HJK 243, W4CYC 240, W9RSO 240, W2BXA 238, W7EK 236, VE3JT 223, W6ITH 223, VE3AEM 222, W2PY 216, W1UE 215, W1TS 211, W9VKF 210, W9GIL 209, W4PL 207, W8FIP 204, W9TWC 203.

The following worked 55 or more Sections. W6ITH ('Phone) leads with 69 Sections! W8AQ 66, W3BES 64, W1TS 63, W6KFC 62, W9ELL 62, W4CYC 61, W7EK 60, W8NLQ 60, W9RSO 60, W1RY 59, VE3JT 59, W6ITY 59, W1INF (Hal) 58, W8FIP 58, W8OYK 58, W9LLW 58, W1APU 57, W7CRH 57, W9RBN 57, W9WFV 57, VE3ACS 56, VE4OC 56, W4PL 56, W9CWW 56, W5DQD 55, W5KC 55, W6HJT 55, W8GQB 55.

### Attention, R. C. C. Applicants

Applications for membership in the Rag Chewers' Club (see page 52, Dec. *QST*) are arriving at Headquarters in every mail. Interest is high. Two important factors in the rules for R.C.C. membership are being overlooked by many of the applicants. First, it is necessary that the "ragchew" (of at least one half hour duration) be *with an amateur who is already a member of the club*. Second, it is necessary for *both* the applicant and the club member worked to submit confirmation of the contact to the Rag Chewers' Club, A.R.R.L., West Hartford, Conn. Be sure the member worked sends in a confirmation of the "chew" . . . and send in your application with necessary details immediately following the contact.

Early members of the R.C.C. who are still active on the air are requested to send a QSL card or message to Headquarters with this information so that they may be included in the active Roster.

—•••—

Hams who have been listening to the fine ham program broadcast by KMTR, Los Angeles, 570 kc., each Saturday, 1 A.M. PST, will be interested in the announcement received from SCM Draper, W6GXM, that this has been changed to *Sunday* mornings, 1 A.M. PST. All radio amateurs are invited to listen.

—•••—

W9PWU, Arvada, Colo., is sending code practice on 1940 kcs., Tuesday and Friday at 7 P.M. and Sunday at 2 P.M.

## QRR Preparation

### By H. J. Burchfield, W6JTV, SCM.

PROCRASTINATION has been the downfall of many a well-intentioned project. Let us not leave 'til tomorrow that which should be done to-day. With this failing in mind a group of fellows in Oakland, California, have done something about it. The plan followed seems to be the most likely and workable so far thought of. Two separate organizations have undertaken two objectives in the line of preparedness. The Oakland Radio Club have gone ahead with the idea of developing fool-proof five-meter mobile communication, where power may be utilized from storage batteries. Another local group known as The Society of Amateur Radio Operators (or S.A.R.O.) has made strides in emergency a.c. powered 160-meter 'phone communication, alternating 80-meter c.w., working from the harmonic of their 160-meter crystals.

The SARO has three complete a.c., 110-volt emergency powered rigs (two more in process of construction). Their combination 160 and 80 rigs are practically all of the same construction, so that any operator will be entirely familiar with any station. A pair of tens, modulated with a pair of 46's in Class B is used. The power supply consists of new Briggs-Stratton gas engines, one-half to one horse power, driving rewound Dodge generators that in turn furnish a.c. for transmitters and receivers. The power supplies are light, so that two men can transport them by hand. With these rewound jobs we get 400 watts running self excited, and as much as 800 watts running with separate field excitation. 400 watts of a.c. at 110 volts is plenty when things are in a jam, when the power-mains are down and no power of any kind is available.

The five-meter mobiles are usually transceivers, with which economy of operation is combined with extreme flexibility of frequency control. Usually of the better and more advanced type, the super-regenerative receivers will cause little or no QRM by a transmitted signal when the rigs are on the receive side.

The 160-meter rigs are set up in the closest possible location to the center of trouble. A five-meter stationary set-up is assigned to each of these lower frequency stations. The mobiles are assigned to their nearest fixed set-up as determined by geographical location. (Several of the mobiles are dry-battery operated so the rigs may be carried bodily to where they are needed.) The 160-meter stations are of course in contact with each other over far greater distances than possible with five meters. That means practically a whole large city may be covered with three to five major stations.

An example of what is possible: A falling building may have injured many inmates; a mobile five-meter rig is available. A message is flashed to the nucleus station; this is passed on to the 160-meter operator. He in turn gives it to the station at relief headquarters, from which point Red Cross workers can proceed at once to the scene with medical supplies. Laborers to clear debris, police protection, or other requirements can be sent without delay. If rising waters endanger a temporary hospital set-up, word may be dispatched by five meters and 160 meters to headquarters, where the necessary workers can proceed with the evacuation. Another. A certain Red Cross Official's advice or presence may be required at another point than that at which he is working. Word is passed from headquarters to his known nearest 160 station, thence by five-meter 'phone to the mobile five working in that vicinity, who in turn dispatches a Boy Scout messenger to find the desired official. Other instances could be cited as to the value of the system, but use your own imagination. Telephone lines down, power cut off, roads torn up, repeated seizures of the earth in the offing, another tornado due, demands for this and that, envision the whole thing for yourself. Prepare for the worst and pray for the best.

Communication outside the stricken section of the country has been thought of and taken care of. This has been turned over to the U. S. Naval Communication Reserve in its entirety. With their already existing network, a corps of trained operators at the keys in various localities, their work needs no enlarging. Well-equipped, with emergency power for their larger transmitters, and their splendid training and "esprit de corps" that their work will be well done goes without saying.

Fellows, may I point out the fact that the amateur is a "service." His only excuse for being on the air in the minds of the powers-that-be is that his work is a training for essential military communications defense *and as the logical means of emergency communication in time of the ever recurrent natural disasters.* Prepare to-day to be ready as opportunity offers to maintain the reputation of our amateur service! Will *you* be ready as operator, and with equipment, when the emergency comes?

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## Briefs

W1GTX has had a favorable response of interest shown in organizing a college net. It is planned to include the following: C.C.N.Y., W2HJ; Bethany College, W8PME-ANU; Purdue Radio Club; Univ. of Virginia, W3GFM-W3UVA; Wesleyan, W1GTX; Okla. A. & M.; U. of Ky.; Geo. Washington Univ.; and Lehigh. Interested operators at additional institutions of learning are requested to note the plans (Sept. *QST*, page 47) and drop a line to Ev Gladding, Box 77, Wesleyan Station, Middletown, Conn., at once to be included in the organization.

—•••—

"The national elections, now past, remind me that in 1928 and 1932, the first election returns to be turned in, in the U.S.A. were handled by ham radio. The votes were from New Ashford, Mass. The Berkshire Brass Pounders of Pittsfield did the job, and in 1932 worked as follows: W1AZW and W1BKG set up 3.5-Mc. c.w. and 1.75-Mc. 'phone outfits in the school house—the polling place. On the other end were W1VC on 1.75 and W1EFM on 3.5. Conditions were terrible and the 'phone couldn't be pulled through, so the first returns were received by c.w. on 3.5-Mc. W1AZD at the local newspaper office took care of the news end of it."

—*W1EFM*

—•••—

W5FLE operating at W5YJ raised VE4ND. The VE commented that it was really something since he was in *Swift Current*, Sask., while W5YJ is in *Stillwater*, Okla.!

*MEDAL PRESENTED BY PRESIDENT WOODRUFF AT THE A.R.R.L. CENTRAL DIVISION CONVENTION*

*Engraving on the reverse side reads, "Presented to Dr. Lee de Forest by The Radio Amateurs in appreciation of his contributions to the science of radio. Chicago, Sept. 6, 1936."*

# How's DX?

### How:

Another month rolls around with its good and bad tidings of things DX, but before we get too deeply involved in the news end we would like to propose a little discussion of an ever-present problem. It is one that whets the appetite of many a DX man, old-timer or aspiring, but the records reveal that a solution has never been reached. It is simply this: Why are certain locations infinitely better than others from a DX standpoint? Why do some stations, such as W8CRA, F8PZ, ZS2A, old XU1U, and others, put in signals day after day, when stations in the same locality don't come through except when conditions get better? If it is the type of antenna they use, why can't the results be duplicated in almost any location, simply by resorting to the same kind of antenna? If it is brute power, how come the results of some of the stations in the medium-power bracket? Or if it is location (which seems to be the people's choice), what is there about certain locations that makes them so superior to others, even nearby ones? In other words, what we need is some rule of thumb that can be used in picking a location, without going to the involved business of conducting listening tests. Up to the present time, the answer has been, "Your guess is as good as mine." Let's improve on that a little.

### Where:

Biggest feather in the cap of any amateur at about this time is, of course, a QSO with Spain. Dana Atcheley, W1HKK, reports hearing EA1BS (7045 kc.) on November 16th at 7:30 P.M., but the laurels go to John Buck Morgan, W3QP, and John Roué, VE1FB, who worked EA4AP (14,385 kc., T5) on December 1st. Quoting from W3QP's letter, "He said no skeds as he cannot always get power when he wants it, but to pass word along to ask boys to QRX for him—may have press or other traffic. Says heavy bombardment, no winner yet!" EA4AP, you know, is said to be operated by newspapermen at the American Embassy in Madrid .. .. .. So that some of you can sleep nights, and add a legitimate country to your list, here is the dope on EL2A, née UN2A. Worked by many, his rocking signal has led many to think him a phoney. Far from that, EL2A is the station of Hank Gould, ex-W8BIS, and is located at Monrovia, Liberia. With 500 watts, and a Yagi antenna with three reflectors and five directors, his T8 signal is S9 all over the U. S., and may be found at 14,400 kc. from 8 to 10 P.M., E.S.T. Your cards may be sent via A.R.R.L., or in an envelope to John Cooper, Government Radio Station ELA, Monrovia, Liberia. (Thanks, W8ZY, W1ICA, W2BMX and W2JGR) .. .. .. A nice bit of DX is NX2Z, operated by OZ2Z at Hochstetter Foreland, East Greenland, worked on 14 Mc. by W9AJA at 1:40 P.M., C.S.T. QSL via the E.D.R., Copenhagen .. .. .. YLAO (6990 kc., T8) is operated by YL2AB .. .. .. You can help VE2GR if you let him know the QRA of F7GC (14,375 kc., T9x), worked during October at 2:30 A.M.

Ed Smith, W8IWI, sends the QRA of PZ1AL: E. C. Van Leeuwaarde, Costerstraate 84, Paramaribo, Surinam. And W3EVW corrects the address of YR5OR to G. Wenzel, Petrosam, Rumania.

### When:

Ten meters has slowed up a trifle but is still capable of handing you some good ones if you have the time. W9BPU worked TF3R and YT7MT during early November to bring his country total up to 76. VK3YP was worked at that unusual time of 8 A.M. .. .. .. The Asians are still a good bet, with J2LU, J2IS, J2IN, and J3FZ reported worked by W2DTB. On the west coast, W6CIS adds J2CE and J3DC to that list .. .. .. G5QY, via W9WC, sends in a long list of 28-Mc. stations worked. Of interest to U. S. amateurs are YR5IG, YR5OR, FA8CR, FV8AB, U2NE, and PY1BR. G5QY thinks the contact with PY1BR on October 24th is the first G-PY QSO on ten. Check?

Twenty meters is following W6CUH's cycle well, and the upswings bring their usual good results. VE2AX sends a mouth-watering list, including PK1PK, KA1MD, J2ME, J3CR, XU8OP, J3DE, J3FI, U9ML, and XU6SW worked, and VS1AA, VS7RF, VU2CQ, VU2IJ, XU2FB, XU8AG, J8CA, J8CF, U9SK, and U9MF among those heard .. .. W9PTW reports working ZE1JR (14,050 kc., T9x) and ZT2Q (14,120 kc., T9x), with ZT2Q his nomination for most consistent African. If it's Africa you need, ZU6AF (14,300 kc., T9x) is on nearly every night around 1 A.M., E.S.T. W6CIS worked him at 8:20 A.M., P.S.T., so he must stay on all day .. .. .. W2HHF sends in a swell list—it's a pity we can't give them all. Here are some of the more choice bits: VK9BA, New Guinea (7150 kc., T7), heard at 3 A.M.; CN8AH, CN8NB, CN8MB, afternoons at 14.420 kc., T7; FK8AA (14,380 kc., T7); CR4AR (14,380 kc., T7), 4 P.M.; J8CF (14,270 kc., T9) and MX2B (14,390 kc., T7), 7–8:30 A.M.; PX1B (14,420 kc., T7), 9 P.M.; VQ3FAR (14,120 kc., T9), afternoons and evenings; VE5NO, Baffin Land, (14,020 kc., chirpy T9); VQ8AA (14,400 kc., RAC), 10 P.M.; VQ8Z, St. Helena (14,450 kc.); VR2AB (14,420 kc., RAC) 10 P.M.; ZB1J and ZB1H (14,390 kc., T9); ZB1E (14,050 kc., T9); SV1KE (14,360 kc., T9) 4 P.M. When you work all those we'll give you some more .. .. .. VE1FB contributes YV3AV (14,325 kc., T8x) and VP7NI (14,400 kc., T7), and adds that if you want a station in Northwest Territory, look for VE5TV (14,300 kc., T7) .. .. .. VU2AM (14,350 kc., T9) was worked at 8 A.M. by W6CIS, who reports J3FZ (14,100 kc., T9) at 5:30 P.M., an unusual time, and XU8SM (14,100 kc., T9) at 8 P.M.

If you work your DX on 'phone, here are some timely tips from Tibbetts, W6ITH: VK2GU (28,120 kc.), ZL1CD (28,520 or 28,640 kc.), J2IS (28,200 kc.), who speaks English well, LU9AX (28,040 kc.), and K7PQ and K7FDE, all come through well during the late afternoon. 6GLK (28,040 kc.) comes through around 8 A.M. On twenty, ZS4J (14,306 kc.), ZS2X (14,370 kc.), ZU6P, and KA1BF (14,155 kc.) are heard in the morning, and ZU6P and LU5AN (14,306 kc.) can be worked during the early evening.

### Who:

Apparently Van, ZU1T, has recovered from his operation, if 28-Mc. QSO's with W3BRZ and W6JN are any indication. We're glad to hear it .. .. .. The Baron Munchausen returns, or at least his ghost walks. H. R. Gebhardt, W8SR, tells of a 28-Mc. contact with F8WQ, with no antenna connected! The report was 449, which went to 589 with the antenna on. Now he wants to know who will be the first to WAC without an antenna! It's nice work if you can get it, if you will pardon a cliché .. .. .. Amateur radio has its problems, at that. For example, power is 30 cents per kilowatt in British Honduras, so VP1WB must be content with receiving tubes (41's) and 220 volts d.c. from the mains .. .. .. On the other hand, life in British North Borneo can be complex, too. G. C. Cawood, VS4CS, writes, "Everything is not all beer and skittles out here in the jungle. A few weeks ago I came home to find a monkey climbing out the window of the shack with my portable transmitter, while most of the receiver was already scattered about the room. Two days ago I walked in as a fowl walked out, and going to the rig I discovered a nice, warm egg plonk in the center of the works. A wrecked grid coil and the variable condensers trodden down to maximum capacity were proof of the trouble the YL had taken before depositing the hen-fruit . . ." .. .. .. W6CUH has not had much time recently, but FR8VX brought his "countries worked" total up to 126. He says he is going to revise his country count on the basis of the new A.R.R.L. DX Map, which "I think is a great idea, and so does everyone out here" .. .. .. Myron E. Terry, XU8MT, is sure QSP is not a lost art, even if it does involve

a little 14-Mc. 'phone DX. Quoting from his letter, "I originated a message from a man critically ill in Shanghai asking advice from his doctor in San Francisco. The first route was XU8MT-KA1BH-W6CUU-W6ITH. But skip and QRM were playing peculiar tricks, and but for the help of many others the messages would not have gone through and come back. . . . VS6AQ told KA1BH I was calling, and filled in when BH could not hear me. W6KW was standing by when W6CUU had difficulty contacting San Francisco. W6IZB relayed the first reply. KA1ME relayed replies and arranged subsequent skeds. W9BEZ offered to help W6CUU to contact San Francisco, and stood by ready. KA1RR telephoned to KA1BH that I wanted to make further contact. VU2LZ called and offered to contact San Francisco. VS6AH was standing by in case VS6AQ should have to close down. . . . Listeners in Cape Town and the British Isles have sent me full transcripts of some of my transmissions during this hook-up." . . . . . From Roy McCarty, W9KA, we learn that VS6AQ is going home to Scotland where he will be on with a "G" call in 1937. Stan of VS6AQ would like to send his very sincere thanks to all "W" stations with whom he has spent many happy hours . . . . . Add description-defying signals: the strange, whispering signal of VE4UV and his Ford-coil plate supply.

## WAC:

Latest 'phone WAC's: OK2AK, Hans H. Plisch; ON4AP, Robert Godefroid; PK3ST, J. H. A. Steenmeyer; PK4AU, J. C. Hopman; VE1CR, C. Reg. Rogers; VE2GA, Joseph A. Robertson; W6EJC, Burton N. Carrick; ZE1JM, W. G. Weyland . . . . . Some nice work was done by Fenton Priest, W3EMM, according to a note from W3UVA, Virginia SCM. On November 22nd he worked, in eight hours, VK5AW, LU7ET, VU7FY, HI7G, G2NH, and ZU6P, all *'phone* contacts. A short time later he worked a VE, giving him WBE in twelve hours . . . . . W2DNG tells of some nice work by Willard Bohlen, W2CPA, who on a crowded Sunday (October 18th) worked VK7LZ, VQ4KTB, VS8AA, OZ8JB, FR8VX, SV1KE, LU4BH, U9MF, K6BHL, FB8AF, ZT6AU, and several W's. Another South American would have given him two WAC's in one day. Not bad, suh . . . . . Latest low-power WAC is to Richard Becker, W5FBQ, who made it with 30 watts input to a 45 final.

—*W1JPE*

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## The Horse Traders Association

Operating on the 56-Mc. band in Connecticut and Massachusetts is a group of some 70 or 80 amateurs known as the Horse Traders Association. Organized by a group of five amateurs in January, 1936, the Association has met with tremendous success. The purposes and activities of the Horse Traders Association are here explained. Purposes and code of ethics: (1) For all-around betterment of five-meter signals; (2) To slight no one; (3) To work all stations who call you provided you hear them; (4) To improve our rigs so as to transmit better signals; (5) To establish a network of Horse Traders from New York to Boston; (6) To create good fellowship and at all times act as gentlemen over the air; (7) To trade horses, soap, grid leaks and standing waves with any member, letting your conscience be your guide as to how you stick the other horse. Requirements for membership: Applicants must work five Horse Trader stations or an equivalent of fifty miles; each five miles counting as one station worked. Applicants must send a card to W1MY or W1FLQ expressing their desire to become a member and listing Horse Traders worked. Applicants must attend a meeting to be initiated before becoming a full member. Meetings are held over the air each Tuesday night starting at 7:30 EST. Other meetings (in person) take place each two months at a location voted by the majority. Horse Trader cards are available to all initiated members. There are no dues, no by-laws and no fights. Each member pays his own way at the shindigs. Officers: W1FLQ, pres.; W1JTF, chairman of board; W1MY, general mgr.; W1QP, 1st vice-pres.; W1JGO, 2d vice-pres.; W1AEY, secy.; Mrs. W1AEY, asst. secy.; W1JLK, treas.; W1JN, bus. mgr.; W1BEC, asst. bus. mgr.; W1XCX (Lt. Joyce, Mass. State Police), chief hay pitcher. Other members: W1DVI FEF HZK DVH DSV JQM BXB FMM ADZ IPV FOG CGS JPB FVR IWL HQZ EFW IKX ACJ BAP FME HVX IJ CSC KK EDL GSV AUK FUE DDP EWI HHA JHM FHN HDF GYT IMF JAM HMO AWW JRV EJO EWD EKY EUG BRL HMB GDC AWW Jr. BKO APJ EBO EFN KAY JRI W2AIU. Honorary members: W1HDQ AIY DEI FZA XO XT BUE JPE DIZ DLJ CJE. During the flood in March, '36, members of this Association rendered valuable assistance. Maintaining regular organization on 56 mc., the Horse Traders Association is prepared to again perform service in any future disasters.

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W6MVK, W.A.S. No. 98, went on the air for the first time on October 7, 1935, and worked his 48th state on February 11, 1936, a total of four months, four days on the air. He is interested to know if any holder of W.A.S. has had a license a shorter time than he.

## The General Traffic Hour

The daily period 6:30–8:00 P.M. (your local time) has been designated the "General Traffic Hour." All Official Relay Station appointees have been requested to keep this period, working general with all amateurs. Trunk Line Station appointees are likewise requested to work general during this period. In this manner operators who are unable to maintain regular schedules or whose operating time is limited may get on the air from 6:30–8:00 P.M. and clear their traffic through O.R.S. and T.L.S. who keep schedules on established traffic routes. Make use of this period so that delivery of traffic and dependability of service may be improved. Give your traffic to stations signing "ORS" or "TLS." "CQ TFC" is the general call for the "traffic hour." Directional CQs will also be found useful during this period.

## Code Speed Contest

On Monday January 11, 1937, WLM/W3CXL will broadcast a speed contest. All amateurs whether A.A.R.S. members or not are invited to participate. The contest will start at 9 P.M. E.S.T. WLM/W3CXL will use automatic equipment and sufficient power to reach most states. The frequencies 6990 and 3497.5 kcs. will be used simultaneously.

Speeds from 20 to 60 w.p.m. in jumps of 5 words per minute will be used. Each transmission will be five minutes and will be clear text. Each speed will have different text. Words will be counted on the basis of five letters to the word. The contest will be run according to the following rules:

1. Anyone having a valid amateur license is eligible.
2. Only one report can be turned in by each participant. Pick out the speed which you are sure is correct.
3. Solid copy for one minute anywhere in the five minute transmission will determine your qualification.
4. A.A.R.S. members send their copies to their Corps Area Signal Officer. Non members send their copies to the nearest Corps Area: (I—C.A., Boston; II—C.A. Governors Island, N. Y.; III—C.A., Baltimore, Md.; IV—C.A., Atlanta; V—C.A., Ft. Hayes, Ohio; VI—C.A., Chicago; VII—C.A., Ft. Omaha, Neb.; VIII—C.A., Ft. Sam Houston, Texas; IX—C.A., Presidio, San Francisco, Calif.).

A.R.R.L. will give letters of commendation to League Members who stand highest in each Area.

The article by Mr. Joseph A. Mullen, W1ASI, wins C.D. article contest prize this month. Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX, 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1937 *Handbook*, six logs, six message files, six pad blanks, or equivalent credit toward other A.R.R.L. supplies. Send your contribution today! —F. E. H.

## Deliveries via 56 Mc.

### By Joseph A. Mullen,* W1ASI

NO ONE can doubt that the A.R.R.L. Trunk Line System is now one of the most well organized communication nets in the country. The lines are well systemized and thoroughly reliable. But a TLS may relay a message to a station located in the city of destination and *that* station for some reason fail to deliver. This is one of ham radio's oldest problems. The writer has originated messages and listened to their progress right into the city of delivery yet the parties never received the messages.

While SCM of Eastern Massachusetts a study of this problem was undertaken. The causes are many. Among them are some cost to the individual for 'phone calls and postage (if much traffic for mail delivery) but more important the matter of personal interest, initiative and responsibility of the operator accepting the message. All hams should want to make ham radio useful to someone besides themselves. The idea of doing useful work on 56 Mc. and getting stations near addressees in our big cities goes together. At last an idea was hit upon that looked quite promising. This was the organization of 56 Mc. stations to take care of local deliveries. Clubs were visited and the matter talked up. The idea was presented at hamfests and a surprising amount of interest was shown especially by the fellows who were working on "five" exclusively. Soon the project was well under way.

The number of reporting stations took a big jump as did the number of deliveries. 3.5 Mc. traffic men began this cross band feature. Many built new five-meter rigs just for this purpose. Some of these stations became interested in traffic work well enough to build 3.5 Mc. stations and get into the game in earnest.

Charts were plotted to ascertain the changes being wrought by this new phase of traffic work and in every case they showed remarkable possibilities. The cost of deliveries at the writer's station decreased 42% the first month.

One of the greatest advantages of this system is the speed factor. One may sit for an hour looking for a station in the general direction of the delivery point and then not hear one. With a five-meter rig at your elbow, very frequently you will spot a station right in the town where the message is going. The greater portion of the five-meter gang will get a big kick out of taking a message from some far distant point on a cross band contact. It frequently happens also, that the delivery via 56 Mc. will also net an answer to the message. More than likely you will be able to relay it over the same channel from which the original came. Lots of fun, especially in doing a real service via our 56-Mc. set up!

It's worth a try fellows and you can rest assured you will not regret using it for a while.

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## With the O.P.S.

EXPERIMENTAL and constructional factors count 50% in the all-season contest in the Official Phone station group. W8EDR, W9HQH and others have points on record in this direction and we suspect other "dark horses" will appear in the finals. Operating factors count another 50% (QSOs and DX count 20%, log and station records 10%, and three quarterly OPS Parties another 20%). In the first of three quarterly tests W8LUQ, W9HSF, W8IJZ, and others (see list below) stand high. That O.B.P. Trophy is a whopper and a beauty, and goes to the best all-around Official 'Phone appointee who adds up points to acquire the best percentage on all counts! An "extra" bulletin was mailed all O.P.S. in

(*Continued on page 98*)

* 218 Jamaicaway, Jamaica Plains, Mass.

## BRASS POUNDERS' LEAGUE

(October 16th—November 15th)

| Call | Orig. | Del. | Rel. | Extra Del. Credit | Total |
|---|---|---|---|---|---|
| W1BTG | 7 | 15 | 881 | — | 903 |
| W3EOP | 37 | 13 | 822 | 5 | 877 |
| W8HMH | 11 | 34 | 804 | — | 849 |
| W5MN | 65 | 127 | 546 | 74 | 812 |
| W7DUE | 24 | 51 | 678 | 37 | 790 |
| W1HTO | 354 | 31 | 348 | — | 733 |
| W9AIJ | 163 | 76 | 483 | 3 | 725 |
| W4PL | 36 | 45 | 596 | 28 | 705 |
| W1UE | 59 | 152 | 439 | 55 | 705 |
| W5CEZ | 80 | 84 | 514 | 15 | 693 |
| W8JTT | 48 | 53 | 572 | 20 | 693 |
| W3CIZ | 50 | 57 | 566 | — | 673 |
| W9PVZ | 73 | 30 | 512 | 26 | 641 |
| W1IP | 12 | 23 | 594 | 12 | 641 |
| W9RMN | 15 | 49 | 530 | 28 | 622 |
| W3BWT | 143 | 60 | 339 | 50 | 592 |
| W8KUN | 24 | 30 | 525 | — | 579 |
| W3FTK | 36 | 31 | 508 | — | 575 |
| W6IOX | 19 | 72 | 410 | 71 | 572 |
| W8KWA | 18 | 43 | 504 | — | 565 |
| W3EZ | 23 | 68 | 428 | 34 | 553 |
| W6KFC | 13 | 17 | 495 | 10 | 535 |
| W1HWE | 165 | 116 | 234 | — | 515 |
| W2HZY | 15 | 14 | 464 | 20 | 513 |
| W2BCX | 12 | 7 | 490 | — | 509 |
| W2HYC | 84 | 42 | 360 | 20 | 506 |
| W9ILH | 10 | 54 | 441 | — | 505 |
| W6CDU | 148 | 24 | 331 | — | 503 |

MORE-THAN-ONE-OPERATOR STATIONS

| Call | Orig. | Del. | Rel. | Extra Del. Credit | Total |
|---|---|---|---|---|---|
| KA1HR | 593 | 476 | 622 | — | 1691 |
| W5OW | 158 | 332 | 800 | 276 | 1566 |
| KA1HR* | 415 | 345 | 564 | — | 1324 |
| W9BNT | 158 | 466 | 472 | — | 1096 |
| W3SN | 102 | 143 | 507 | — | 752 |
| W3CXL | 11 | 17 | 560 | — | 588 |

These stations "make" the B.P.L. with *totals* of 500 or over. Many "rate" extra credit for one hundred or more deliveries. The following one-operator stations make the B.P.L. for *delivering 100 or more messages;* the number of deliveries is as follows: Deliveries count!

| | | |
|---|---|---|
| W1FRO, 180 | W1INF, 148 | W1IZW, 107 |
| W2KI, 172 | W6JTV, 137 | W6MQM, 101 |
| W9IQI, 168 | W2JBL, 114 | |

* Sept.–Oct.

A.A.R.S. STATIONS

| Call | Orig. | Del. | Rel. | Extra Del. Credit | Total |
|---|---|---|---|---|---|
| WLVH (W6BMC) | 20 | 17 | 501 | — | 538 |
| WLMI (W6GXM) | 93 | 192 | 243 | — | 528 |
| WLNF (W2BCX) | 5 | 10 | 504 | — | 519 |

WLY (W6RJ) made the B.P.L. for *delivering 107 messages.*

MORE-THAN-ONE-OPERATOR STATIONS

| Call | Orig. | Del. | Rel. | Extra Del. Credit | Total |
|---|---|---|---|---|---|
| WLM (W3CXL) | 123 | 170 | 2028 | — | 2321 |

A total of 500 or more, or just 100 or more *deliveries* will put *you* in line for a place in the B.P.L.

| Station | QSOs | Sections | Heard | Score | Power | Section |
|---|---|---|---|---|---|---|
| W8LUQ | 36 + 2 | 18 | 22 | 4212 | 400 | W. N.Y. |
| W9HSF | 24 + 20 | 20 | 1 | 4020 | 90 | Ind. |
| W8IJZ | 32 + 2 | 16 | 18 | 3296 | ... | Ohio |
| W2HNP | 27 + 29 | 24 | 2 | 2810 (6816)* | 160 | No. N.J. |
| W9TTA | 31 + 1 | 14 | 12 | 2576 | 100 | Ind. |
| W8FIP | 33 + 9 | 14 | 3 | 2534 | ... | W. Pa. |
| W1AVP | 11 + 6 | 24 | 8 | 2232 | ... | Vt. |
| W2CBO | 26 + 1 | 14 | 10 | 2170 | 500 | E. N.Y. |
| W8KNF | 28 | 12 | 17 | 2088 | 110 | Ohio |
| W4CYB | 25 + 1 | 14 | 7 | 2016 | 250 | N. C. |

| Call | QSOs | Power | Score | Call | QSOs | Power | Score |
|---|---|---|---|---|---|---|---|
| W8JFC | 26 + 2 | 100 | 1728 | W8AAR | 12 + 1 | 150 | 770 |
| W8MOL | 22 | 350 | 1632 | W8MOP | 16 | 150 | 756 |
| W8HFR | 24 | 100/350 | 1562 | W8CDR | 17 | 40 | 707 |
| VE3KM | 22 + 2 | 200 | 1536 | W9ACU | 10 + 3 | 20 | 510 |
| W3BRZ | 18 | 150 | 1352 | W9IAW | 9 | 275 | 399 |
| W8CGU | 21 | 200 | 1155 | W8NYY | 4 | 250 | 384 |
| W1EAO | 14 + 2 | 150 | 1128 | W2IKV | 10 | 200 | 378 |
| W1DWP | 16 | 70 | 1080 | W1GZL | 4 | 75 | 376 |
| VE3NX | 21 + 1 | 100 | 1008 | W2GYY | 9 | 150 | 355 |
| W4QI | 16 | 100 | 816 | W8JTI | 11 | 35 | 285 |

# CORRESPONDENCE

**The Publishers of *QST* assume no responsibility for statements made herein by correspondents**

## Mostly About 160-'Phone

P. O. Box 481, Westwood, N. J.

Editor, *QST:*

In my estimation, the soundest bit of thinking that has yet been put in print is the letter from W5AL in the November issue. And if all the boys who are tooting their horns to make 160 a Class-A band, will sit down and soak up the little bit of advice offered by W5AL, they will readily see that no matter in what Class you put 160 the condition will still remain. . . . Most b.c.l.'s will coöperate when trying to solve the problem of this type QRM, but I will agree that there are exceptions to the rule. There isn't much that can be done in these cases except to sit tight and see what happens, *if the ham is within his or her rights.* The average ham has sunk a young fortune in the building of his rig and he, too, would like to get some enjoyment out of a thing which he has made his hobby. It is true that a station may operate on reduced power which does a lot to help remedy the QRM situation and there are times when 40 watts will do as good as 400. But if all the solutions that have thus far been given for the elimination of the BCL QRM, I think I am safe in saying that W5AL's idea would outweigh them all. Let's see some more letters like it.

*—J. George Murcken, Jr., W2CFK*

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1 Evergreen Ter., Cumberland, Md.

Editor, *QST:*

. . . W8KSY . . . is just like about 10,000 other hams in this country, never satisfied. What is going to happen to the ham bands is that the F.C.C. is going to get sore and tired of the hams always fighting and take the whole thing away. If they did we would have nobody to blame but ourselves. So the Class A boys want 160 now! A couple of months ago they wanted part of the 40-meter band. . . .

W5AL is right—the present b.c.l. sets aren't perfect. The trouble with the present line of sets is that they are just made to sell. Ask any serviceman that. Any guy that knows anyways half about radio knows that you can't buy a 20-tube set for fifty bucks without getting gyped somewhere. . . . *—Robert O. Slemmer, W3ETE*

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521 E. Lafayette St., Fayetteville, Ark.

Editor, *QST:*

I wish to give a "pat on the back" to W5AL for his constructive letter on coping with the b.c.l. QRM problem as it is very helpful and, while not a panacea, it has presented the best methods so far.

By all means I wish to give a healthy "kick in the pants" to whoever brought up the argument for Class A for 160, regardless of which side of the fence they are on. . . . I have noticed that most of these arguments begin in the fall of the year just after a hot summer, and it seems to me that they are inspired by the after-effects of the summer heat. Let's call a halt on these controversial arguments that get us nowhere and devote the pages of the Correspondence Section to *constructive* suggestions such as W5AL, W3FAR, and others for improving our conditions *without restricting any group of hams who are sincere in their efforts.* . . .

*—Lester Harlow, W5CVO*

EDITOR'S NOTE.—Similar sentiments are expressed by Orley J. Corkwell, W8IAL; Bruce H. Hart, W9YOO; M. C. Bartlett, W9JHY; and U. O. Sanders, W8LTC.

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18030 Waltham Ave., Detroit, Mich.

Editor, *QST:*

Having just retired as S.C.M. of Michigan Section, feel free to express my views on Ham Radio Enemy No. 1, c.w. vs. 'phone, without fear of harming the Section spirit.

This constant wrangling is doing amateur radio no good—both with the public and with the gang itself. Every year about this time the 'phone boys get going. They want more frequencies. . . . Petitions are made up. . . . The grapevine functions. The c.w. men get worried—drop their skeds, dig down into their jeans and send out the other side of the story with petitions to be signed. All this at a cost in dollars and cents and of perhaps greater importance in energy that could be put to constructive use. . . .

The plan we have worked out to put a stop on this hate-producing energy-wasting yearly argument is quite similar to the thoughts put forth by our good friend W8KSY in a recent *QST* letter. With the F.C.C. reporting practically all their trouble with ham radio is through the inexperienced 160-meter men, we suggest that the 80-meter 'phones be moved to 160 with only Class A licensees allowed to operate. . . .

. . . The 80-meter band for 'phone as it now stands is NG. Every one agrees to that. The DX-hounds have moved to 20. Its DX capabilities

over the 160-meter band was the reason given for giving 'phones space on the 80-meter band in the first place. With the present congestion DX is impossible except in rare cases.

Re 160-meter men at present. A lot of the boys are capable (don't forget also that the more capable ones are perhaps Class A licensed) but something should be done to stop the thousands of new hams from becoming the *voice* of amateur radio (to the b.c.l.) when they haven't had time to get the spirit of the thing properly into their skulls. That's no reflection on anyone's ability—we must realize that a thorough understanding of this game takes much thought and we all know that the new fellow is so wrapped up in licenses, new rigs, theory and new calls that he can't possibly absorb any of the other angles on amateur radio—there are too many of 'em!

Can you imagine a year going by without a cross word between 'phone and c.w. men—a Board meeting without c.w./'phone as the main issue—traffic men putting in a full season on the nets—'phone men not thinking up . . . sarcastic things to say about the c.w. man—more harmony throughout the whole structure of hamdom? A more solidified front against the powers that be (man, do we need that!)? We could go on for hours—but if you'd like to kill this "disease" at its source separate the 80-meter 'phones from the c.w. men and watch the results. Let your Director know.

*—Kenneth F. Conroy, W8DYH*

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2533 Olinville Ave., New York, N. Y.

Editor, *QST*:

I have read the various comments made in *QST* concerning Class A operation on 160 meters and . . . I find that the Class A ops on 160 meters are too carefree and do not show much ham spirit. I am speaking of the hams in general, as there are some exceptions.

From what I have read and heard, I make the following suggestions for a trial:

1. That the 75-meter amateur 'phone band be given the privileges that the 160-meter band have at present.
2. That the 160-meter band be given the privileges of the present 75-meter band.

In this manner I think that the "sloppy" operating of the 160-meter gang will be eliminated, and the Class A ops, will be given the chance to show their fine operating skill on 160, without getting any QRM from the "lids." . . .

*—J. Santangelo*

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## Coronation QSL

102 Third St., Kirkland Lake, Ont., Can.

Editor, *QST*:

I would like to present to Canadian hams through the pages of *QST* a suggestion that was given me during a talk with VE3QB. . . .

How about a special QSL card for next year in honor of the coronation of England's King? I think that it would be fitting to show our loyalty to the Crown in some manner, and I do not know of any way that it could be shown to the world at large at a smaller cost than that.

I suggest a card with a royal red background, the call in royal blue, and across the top in royal gold the wording, "Special Coronation Year QSL," with a crown on each side of the wording, it in gold also.

There is the idea, gang. What response do I hear from you? We want to make it snappy, as next year is just around the corner.

*—C. C. Dunlop, VE3AGM*

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## He Condemns Spanish News

10 Bridge St., New York, N. Y.

Editor, *QST*:

I severely condemn your insertion of news relating to Spain in the I.A.R.U. section of the December issue of *QST*. In this section you print information obtained from a German amateur which states that EA4AO had been executed by the Loyalists as well as all the other U.R.E. official organization. This information, as it appears, will be read by thousands of American radio amateurs who, in some cases, will receive an entirely wrong impression of democracy's fight against Fascism in the Spanish republic. You unknowingly, or intentionally, published a report sent to you by a German, a Nazi without doubt, whose sole purpose was to create just that which I mention above.

If you are a careful reader of newspapers you should, by this time, know of the brutality of the Fascist forces in their bombardment of Madrid—the murder of women and children—in their desperate attempt to smash the government which the Spanish people democratically elected.

Henceforth you should, as a matter of justice, ignore all information received from Fascist sources. In the January issue of *QST* it will be well for you to insert another article in the I.A.R.U. section which should describe the murder of Spanish people in Madrid by the Fascists, as an atonement. If you care nothing about human beings you can mention the destruction of Spanish amateur stations in Madrid by Fascist shells.

I am, at this time, also sending a letter protesting against your report about Spain to Mr. Eugene C. Woodruff and to an American organization in this city which is helping Spanish democracy.

*—Robert Kreisinger*

EDITOR'S NOTE.—No one could fail to condemn *QST* for injecting itself into external political affairs, either national or international. We exist to present the news of amateur radio—not to censor, interpret, or embellish that news. It is not our province to tell of the progress of the internecine struggle in Spain, nor to evaluate the merits of either cause. It is, and will be, our purpose to present every scrap of information, including every report and its source, that we are able to secure. In this connection, the attention of Mr. Kreisinger and others who may have overlooked it, is directed to the "Flash!" on page 43 of the same issue.

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## 'Phone—29–30 Mc.?

Wharton, Texas

Editor, *QST*:

. . . I wonder how many of you think we can keep the 29 Mc. to 30 Mc. part of the band without using it? My guess is, not over a year or so longer.

Those of you who are active on ten know that if occupancy continues in the future as it has lately, we will need the whole 2000 kc. before another two years has passed. The c.w. operator will not use the 29 Mc. to 30 Mc. part of the band simply because there is no one in it. Why not put the 'phones in that part of the band? I operate 'phone, mostly, and cannot think of any reason why this should not be done. If it is done that part of the band will be occupied immediately. It is not necessary for the change to be expensive. The old crystal can be ground down in a few minutes and new ones are inexpensive. . . .

*—Clarence Vick, W5DUQ*

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## Special Five-Meter Licenses

1204 S. Richmond, Tulsa, Okla.

Editor, *QST*:

In this city, and probably many others, there are numerous unlicensed 5-meter operators. While most of them are knowingly violating the rules of the F.C.C., they continue to operate, month after month, and year after year. Many state they are endeavoring to gain the necessary code speed to take the Class B exam, but few really attempt it.

The members of this club believe steps should be taken to bring such illegal operators within the law, in the hope of later making them full-fledged hams. Therefore, we suggest the following:

1. An additional class of amateur exam should be provided which should consist of a light exam on 5-meter theory and permit operation on the 5-meter band only.

(*Continued on page 66*)

WE WHO devote our working hours to amateur radio find that the holiday spirit comes very easily. Perhaps this is because the stuff that amateur radio is made of is not so much engineering as good fellowship. Night and day the air is laden with messages of friendliness, addressed to all who listen. Personal as the spoken word and swift as thought, *CQ* links the world in genial fellowship. . . . Sometimes when we look at Christmas cards we wonder why their artists had to turn back the calendar so far to catch the Christmas spirit. If we were to draw a symbol of Christmas fellowship, our card would not show a snow-bound stagecoach, but a simple home-made antenna silhouetted against a transparent midnight sky. Perhaps a blanket of clean white snow upon the ground to erase for this quiet moment the scars of man's labor on the earth. Perhaps a single lighted window glowing in the dark to mark where a solitary man joins greetings with unmet friends. Goodwill to men. . . . For us, we hope this picture will be a reality and not a symbol. May all who listen hear our "Hail and Godspeed!" on Christmas Eve! And to those who may not hear our greetings then, we send them on this page by proxy. Merry Christmas, Everybody!

JAMES MILLEN

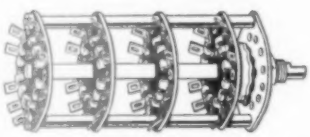
The RIGHT COMBINATION at your fingertips

Here's some light on that SELECTOR SWITCH PROBLEM, you Knight of the soldering iron.

If the circuit calls for more lugs than a centipede has feet scram over to your jobber, and make up your own SELECTOR SWITCH . . . thousands of different combinations possible with a CENTRALAB Kit at his place.

SWITCHES FOR

- Analyzers
- Output Meters
- R F Oscillators
- Tube Checkers
- Decade Boxes
- Capacitance
- Resistance
- Ham Equipment
- P A Work
- Volt-Ohm-Am Meter
- Radio Receiver Replacements
- A F Oscillators



Centralab

Milwaukee, Wisconsin

British Centralab, Ltd.
Canterbury Rd., Kilburn,
London N.W. 6, England

French Centralab Co.
118 Avenue Ledru-Rollin,
Paris XI, France

## Correspondence Dept.

(*Continued from page 64*)

2. Those passing said exam should be designated by a numeral instead of an alphabetical call.

3. The term of such a license should be for not more than six months or a year, and not be renewable.

4. If during the term of the license, said operator has not passed a regular Class B or C license, he is legally through with amateur radio.

5. Such special licensees should be admitted to full voting membership in A.R.R.L. in an effort to give us a better rating in Washington.

Then, too, with more users, the 5-meter band should be doubly hard to take away from us. We would appreciate seeing the reaction of other clubs and individuals in this column.

—*C. P. Zimmerman, Sec.-Treas.,*
*Tulsa Amateur Radio Club*

## Skin Effect Law Appealed

2913 Griffin Ave., Richmond, Va.

Dere Eddie:

Wot we want to know down here is: Who cured wire of skin effect at h.f. and when?

We notice in ur October number on page 34: "Braid of any form is to be avoided in the tank circuit, as this material has very high radio frequency resistance."

Now if we bin wasting kilowatts down here due to the misguided idea that braid is a good r.f. conductor due to increased area and skin effect, please set us right.

Now wot gets us sore down here is these here Haywire Hanks, wid a sig like a locoed buzz saw, St. Vitus dance from the shoulder down and the weights on their new bug pushed all the way back to their elbows, which sends stuff that they cudn't copy fer a new HRO!

And these pimpylous young squirts that answer 30 per CQ's before they get out of the 15 per class is just as bad.

—*A. M. Leake, W8BCI*

EDITOR'S NOTE.—No law has yet repealed effect of skin effect. However, practical research has shown that skin effect in braid differs from skin effect in a solid or insulated-strand conductor (such as Litz). Neither "fish nor fowl," separate strands in braid are not insulated nor are they in perfect electrical contact. Result: Losses. If you want to shield plate or grid leads effectively at high r.f., don't use braid; use copper tubing.

## M.D. Net

Veteran's Administration Hospital,
12th Ave. and E St., Salt Lake City, Utah

Editor, *QST:*

Since being interested in this radio game it has occurred to me that an organization of M.D. hams would be fun if there were enough of them interested in it.

Dr. C. A. Sherman, W9SVC, and the undersigned would be glad for any such to communicate with either one of us; and if there prove to be enough we will undertake to get them together on the air in some fashion.

We had in mind something on the order of a round-robin, with perhaps all on the same frequency, once or twice a month. . . .

—*C. F. Sherman, M.D., W6NWL*

## California Kilowatts Move East

1026 S. 48th St., Philadelphia, Pa.

Editor, *QST:*

I am thinking of taking up stamp collecting. The reason?

Last week I heard two hams chatting pleasantly along on 75-meter 'phone. The first chap said he was running 1750 watts (count 'em!). The second came right back and said that 1750 watts was nothing—he was running 2500 watts, and the tubes weren't even heating up.

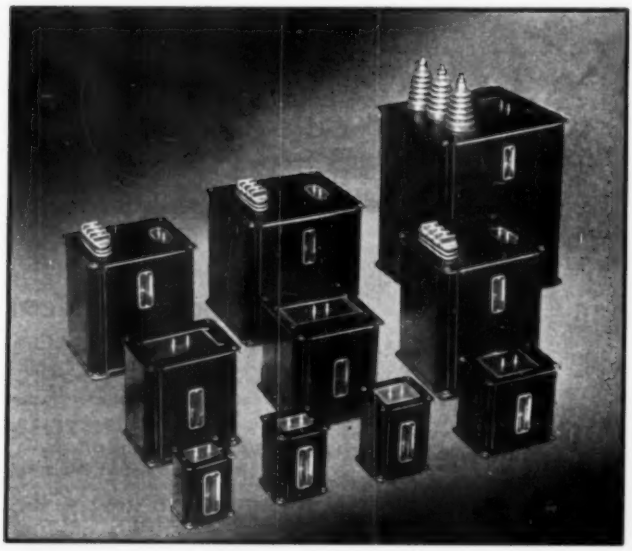
(*Continued on page 72*)

# KENYON

## "T LINE"

### CATALOGUE

A CATALOG OF
AUDIO AND POWER COMPONENTS FOR
AMATEUR TRANSMITTER AND
PUBLIC ADDRESS SYSTEMS



## IF YOU'RE WISE—
## YOU'LL KENYONIZE

**KENYON TRANSFORMER CO., INC.**

**840 BARRY STREET, NEW YORK, N. Y.**

**Export Department:**
**25 Warren Street**
**New York, N. Y.**

**Cable Address:**
**SIMONTRICE—NEW YORK**

# KENYON AMATEUR TRANSMITTER AND PUBLIC ADDRESS COMPONENTS

Kenyon engineers have designed this complete line of audio and power transformers and reactors to make possible a popular priced line particularly suited for amateur transmitter and public address use.

Refinements in design and controlled production result in units which are unapproachable for quality in material of this price range.

Each unit is housed in a metal case finished in a durable black eggshell enamel presenting a pleasing appearance to suit exacting commercial requirements. This case also acts as an electrostatic and electromagnetic shield.

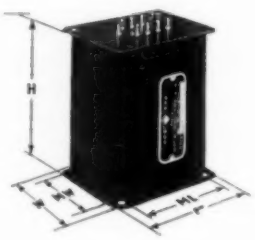
Universal mounting facilities permit all units to be top or bottom mounted to chassis or panels.

With the exception of the high voltage units which are provided with glazed ceramic insulators all units are provided with sturdy solder lug terminals.

## KENYON TRANSFORMER CO., INC., NEW YORK, N. Y.

### T LINE DIMENSIONS

| Case | Mounting Dimensions ML | MW | Overall Dimensions Length | Width | Height |
|---|---|---|---|---|---|
| 1A | 2 1/32 | 1 9/16 | 2 7/16 | 2 | 2 7/8 |
| 2A | 2 1/8 | 1 13/16 | 2 3/4 | 2 3/8 | 3 3/16 |
| 3A | 2 7/16 | 1 15/16 | 3 1/16 | 2 9/16 | 3 5/8 |
| 4A | 3 7/8 | 2 7/16 | 4 1/2 | 3 | 3 7/8 |
| 5A | 4 5/16 | 3 3/16 | 5 | 3 7/8 | 5 |
| 6A | 4 1/2 | 4 5/16 | 5 | 5 1/8 | 5 |
| 7A | 5 1/2 | 4 5/16 | 6 5/16 | 5 3/16 | 6 3/8 |
| 8A | 5 3/4 | 4 13/16 | 6 9/16 | 5 11/16 | 7 1/8 |
| 9A | 6 15/16 | 5 3/4 | 7 3/4 | 6 5/8 | 7 7/8 |
| 10A | 8 5/8 | 7 11/32 | 9 1/2 | 8 1/4 | 10 5/8 |




### INPUT TRANSFORMERS

| Type | | Case | List Price |
|---|---|---|---|
| T-1 | Single or double button microphone to one grid. Input — 400-300-200-100-50 ohms. Hum bucking type | 1A | $4.00 |
| T-2 | Multiple line to one grid. Input — 500-333-250-200-125-50 ohms. Hum bucking type | 1A | 4.00 |
| T-3 | Multiple line to P. P. grids. Input — 500-333-250-200-125-50 ohms. Hum bucking type | 1A | 4.00 |
| T-4 | Detector plate, high impedance pickup, or double button microphone to single grid | 2A | 5.00 |

### LINE TRANSFORMERS

| | | | |
|---|---|---|---|
| T-25 | Line to line matching transformer. Primary — 500-200-50 ohms. Secondary — 500-200-50 ohms | 2A | 5.00 |
| T-27 | 500 or 200 ohms to 15-8-4 ohms — Level 15 watts | 3A | 5.00 |
| T-28 | 500 or 200 ohms to 15-8-4 ohms — Level 30 watts | 4A | 6.00 |
| T-29 | 500 or 200 ohms to 15-8-4 ohms — Level 60 watts | 5A | 9.00 |

### CLASS "A" INPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-51 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A. Grid. Ratio 1:4 | 1A | 3.50 |
| T-52 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:4 | 1A | 3.50 |
| T-53 | Detector plate or single button microphone to single grid | 1A | 3.50 |

**For portable applications use open type KA114M. List Price $2.25**

| | | | |
|---|---|---|---|
| T-54 | P. P. Class A plates 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:1.8 (total pri. to total sec.) | 2A | 4.50 |
| T-55 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A Grid. Ratio 1:3 | 2A | 4.50 |
| T-56 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:2 (total pri. to total sec.) | 2A | 4.00 |
| T-57 | Single Class A Plate 56, 75, 6C5, 77 (triode) 6C6 (triode) etc. to single Class A Grid. (Ratio 1:2). Hum bucking type | 2A | 5.00 |
| T-58 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to P. P. Class A Grids. Ratio 1:2 (total pri. to total sec.). Hum bucking type | 2A | 5.00 |

### CLASS "AB" AND "B" INPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-251 | Single 53, 6A6, 56, 6C5, etc. to P. P. 53, 6A6, etc. (Single 53, 6A6, etc. in P. P.) | 2A | 4.50 |
| T-252 | Single 30, 49, 89 to P. P. 19, 30, or 49's | 1A | 3.50 |

**For portable applications use open type KR19. List Price $1.50**

| | | | |
|---|---|---|---|
| T-253 | Single 46 or 59 to P. P. 46's or 59's, 6F6's, etc. | 2A | 4.50 |
| T-254 | Single 45, 6F6, 2A5, 42 etc. to P. P. 6F6, 45's, 2A5's, 42's, etc. | 2A | 4.50 |
| T-255 | P. P. 56, 76, 6C5, 53, 6A6, 6N7 to P. P. 6L6's | 2A | 4.50 |
| T-256 | P. P. 56, 76, 6C5, to P. P. 45's, 2A3's, 6F6's, etc. | 2A | 4.50 |
| T-257 | P. P. 45's to P. P. Parallel 46's | 2A | 4.50 |
| T-258 | P. P. 45's to P. P. 800's | 3A | 5.00 |
| T-259 | P. P. 2A3's to P. P. 203A's, 838's, etc. | 4A | 6.00 |
| T-260 | P. P. parallel 2A3's to P. P. H.D. 203A's, P. P. Parallel 838's, etc. | 4A | 8.00 |
| T-271 | P. P. 45's, 2A3's, 6F6's (triode) to P. P. Class AB2 6L6's | 3A | 5.00 |

## CLASS "A" OUTPUT TRANSFORMERS

| Type | | Case | List Price |
|---|---|---|---|
| T-101 | Single Class A Plate 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to 500 or 200 ohms | 1A | $3.50 |
| T-102 | P. P. Class A Plates 56, 76, 6C5, 77 (triode) 6C6 (triode) etc. to 500 or 200 ohms | 1A | 3.50 |
| T-103 | P. P. 45's, or 43's to 500-200 or 15-8-4 ohms | 2A | 5.00 |
| T-104 | Single 2A5, 6F6, 89, 47 etc. to 500-200 or 15-8-4 ohms | 2A | 4.50 |
| T-105 | P. P. 2A5, 6F6, 89, 47 etc. to 500-200 or 15-8-4 ohms | 2A | 5.00 |
| T-106 | P. P. 6B5, 2B6, to 500-200 or 15-8-4 ohms | 3A | 5.50 |

## CLASS "AB" AND "B" OUTPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-301 | P. P. 45's, 2A3's (Class AB) 6L6's (Class A) to 500-200 or 15-8-4 ohms. Primary 5000 or 3000 ohms | 4A | 6.00 |
| T-302 | P. P. 6N7, 53, 49's, 19 to 500-200 or 15-8-4 ohms | 3A | 5.50 |
| T-303 | P. P. 46, 59's, 6F6's (triode or pentode) 2A5's, 42's to 500-200 or 15-8-4 ohms. Primary 10,000 or 6000 ohms | 4A | 6.00 |
| T-304 | P. P. Parallel 45's, 2A3's to 500-200 or 15-8-4 ohms Primary 1500 or 2500 ohms | 4A | 8.00 |
| T-305 | P. P. Parallel 46's, 59's, 6F6's, (triode or pentode) 2A5's, 42's to 500-200 or 15-8-4 ohms. Primary 5000 or 3000 ohms | 4A | 8.00 |
| T-317 | P. P. 6L6's Class $AB_1$ (6600 or 3800 ohms — 34 watts) to 500-200 or 15-8-4 ohms | 4A | 8.00 |
| T-319 | P. P. 6L6's $AB_2$ (6000 or 3800 ohms — 60 watts) to 500-200 or 15-8-4 ohms | 5A | 8.50 |

## MODULATION OUTPUT TRANSFORMERS

| | | | |
|---|---|---|---|
| T-451 | Class B 6N7, 53, 6A6, RK34, to 5000 or 3000 ohms. Max. Sec. D.C. 100 M.A. | 2A | 4.50 |
| T-452 | Class B 19, to 5000 or 3000 ohms. Max. Sec. D.C. 50 M.A. | 1A | 3.50 |
| | **For portable application use open type KR19M. List Price $1.50** | | |
| T-453 | Class AB 2A3's, 45's or Class A, 6L6's to 5000 or 3000 ohms. Max. Sec. D.C. 130 M.A. | 4A | 8.50 |
| T-454 | Class B 46's or 59's, 6F6's (triode or pentode) 2A5's, 42's etc. to 4000-6000-8000 ohms. Max. Sec. D.C. 140-100-75 M.A. Primary 6000 or 10,000 ohms | 4A | 8.50 |
| T-455 | Class B — 210's to 5000-7000-9000 ohms. Max. Sec. D.C. 180-150-130 M.A. | 5A | 10.00 |
| T-456 | P. P. Parallel 45's or 2A3's Class AB to 5000-7000-9000 ohms. Max. Sec. D.C. 150-100-75 M.A. | 5A | 10.00 |
| T-457 | P. P. Parallel 46's, 59's, 6F6's, (triode or pentode) 2A5's, 42's etc. to 3000-5000-7000 ohms. Max. Sec. D.C. 220-160-120 M.A. Primary 3000 or 5000 ohms | 5A | 10.00 |
| T-465 | P. P. 838's, 203A's to 4000-6000-8000 ohms. Max. Sec. D.C. 400-320-270 M.A. | 7A | 25.00 |
| T-470 | P. P. H.D. 203A's to 4000-6000-8000 ohms. Max. Sec. D.C. 500-400-350 M.A. | 8A | 42.00 |
| T-490 | Single 2A5, 42 or 6F6 grid modulation transformer to grid modulate 203A's, 211's, etc. | 2A | 4.50 |
| T-491 | Single 45 grid modulation transformer to grid modulate 203A's, 211's, etc. | 2A | 4.50 |
| T-458 | P. P. 801's to 5000-7000-9000 ohms. Max. Sec. D.C. 150-135-110 M.A. | 6A | 12.50 |
| T-460 | P. P. 800's to 6000-8000-10,000 ohms. Max. Sec. D.C. 200-175-150 M.A. | 6A | 15.00 |
| T-492 | Grid or suppressor modulation transformer — P. P. 45's to 10,000 ohm load | 3A | 5.00 |
| T-459 | P. P. 6L6's Class $AB_2$ to 2500-5000-7000 ohms. Max. Sec. D.C. 300-250-200 M.A. | 5A | 8.50 |

## FILTER REACTORS

| Type No. | Inductance Henries | Max. MA. | D.C. Resistance | Insulation Test | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-155 | 290 | 10 | 4700 | 1000 V. | 2A | $4.00 |
| T-158 | *350 | 10 | 10000 | 1000 V. | 3A | 4.50 |
| T-156 | 30 | 25 | 800 | 1000 V. | 1A | 3.00 |
| T-157 | 20 | 50 | 200 | 1000 V. | 1A | 3.00 |
| T-153 | 30 | 90 | 350 | 1000 V. | 3A | 3.50 |
| T-154 | 15 | 165 | 210 | 1000 V. | 3A | 4.00 |
| T-152 | 10 | 200 | 100 | 1000 V. | 3A | 4.00 |
| T-164 | 14 | 250 | 135 | 1500 V. | 5A | 9.00 |
| T-166 | 11 | 300 | 125 | 1500 V. | 5A | 9.00 |
| T-159 | 12 | 500 | 77 | 1500 V. | 6A | 12.50 |
| T-165 | 10 | 150 | 275 | 3000 V. | 3A | 4.00 |
| T-168 | 13 | 250 | 125 | 3000 V. | 5A | 10.00 |
| T-160 | 11 | 300 | 120 | 3000 V. | 5A | 10.00 |
| T-167 | 11 | 400 | 80 | 3000 V. | 6A | 12.00 |
| T-175 | 10 | 200 | 140 | 5000 V. | 4A | 7.00 |
| T-176 | 10 | 300 | 110 | 5000 V. | 5A | 11.00 |
| T-178 | 10 | 400 | 90 | 5000 V. | 6A | 15.00 |
| T-177 | 12 | 500 | 95 | 5000 V. | 7A | 18.00 |

*Center tapped.

## SWINGING REACTORS

| Type No. | Inductance Henries | Max. MA. | D.C. Resistance | Insulation Test | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-517 | 15-45 | 90-20 | 350 | 1000 V. | 3A | $3.50 |
| T-515 | 10-25 | 165-30 | 210 | 1000 V. | 3A | 4.00 |
| T-506 | 5-20 | 200-30 | 100 | 1000 V. | 3A | 4.00 |
| T-507 | 7-25 | 250-50 | 135 | 1500 V. | 5A | 9.00 |
| T-510 | 6-19 | 300-30 | 125 | 1500 V. | 5A | 9.00 |
| T-511 | 5-20 | 170-20 | 275 | 3000 V. | 3A | 4.00 |
| T-508 | 7-26 | 250-50 | 125 | 3000 V. | 5A | 10.00 |
| T-514 | 5-20 | 300-50 | 120 | 3000 V. | 5A | 10.00 |
| T-516 | 5-20 | 400-50 | 80 | 3000 V. | 6A | 12.00 |
| T-509 | 6-19 | 200-30 | 140 | 5000 V. | 4A | 7.00 |
| T-512 | 5-15 | 300-30 | 110 | 5000 V. | 5A | 11.00 |
| T-513 | 5-18 | 400-50 | 90 | 5000 V. | 6A | 15.00 |
| T-521 | 6-21 | 500-60 | 95 | 5000 V. | 7A | 18.00 |

## PLATE TRANSFORMERS

| Type No. | Primary | A.C. Secondary Volts | | D.C. MA. | Case | List Price |
|---|---|---|---|---|---|---|
| T-664 | | 740-0-740 | | 150 | 5A | $8.00 |
| T-655 | *Tapped | 460-0-460 | | 250 | 5A | 9.00 |
| T-656 | *Tapped | 740-0-740 | | 300 | 6A | 12.00 |
| T-657 | †Tapped | 900-0-900 | (2 separate secondaries) | 200 / 200 | 7A | 26.00 |
| | | 900-0-900 | | | | |
| T-658 | ‡Tapped | 520-0-520 | (3 separate secondaries) | 175 / 175 | 7A | 21.00 |
| | | 570-0-570 | | | | |
| | | 570-0-570 | | 175 | | |
| T-654 | ‡Tapped | 490-0-490 | (3 separate secondaries) | 250 / 250 | 8A | 30.00 |
| | | 630-0-630 | | | | |
| | | 630-0-630 | | 250 | | |
| T-659 | ‡Tapped | 520-0-520 | (3 separate secondaries) | 350 / 350 | 8A | 30.00 |
| | | 570-0-570 | | | | |
| | | 570-0-570 | | 350 | | |
| T-665 | *Tapped | 1180-0-1180 | | 250 | 7A | 22.00 |
| T-666 | | 1460-0-1460 | | 350 | 8A | 26.00 |
| T-667 | | 1460-0-1460 | | 500 | 9A | 34.00 |
| T-660 | | 1460-0-1460 | (2 separate secondaries) | 500 / 200 | 9A | 38.00 |
| | | 630-0-630 | | | | |
| T-661 | | 2080-0-2080 | | 200 | 7A | 22.00 |
| T-662 | | 2080-0-2080 | | 300 | 8A | 30.00 |
| T-663 | | 2360-0-2360 | | 600 | 10A | 70.00 |

*Primary tapped to increase the above secondary voltages approximately 25%.

†Primary tapped to increase the above secondary voltages approximately 30%.

‡Primary tapped to increase the above secondary voltages approximately 12.5% and 25%.

## PLATE AND FILAMENT TRANSFORMERS

| Type No. | Sec. Volts | D.C. MA. | F1 | F2 | F3 | F4 | Case | List Price |
|---|---|---|---|---|---|---|---|---|
| *T-249 | 235-0-235 | 80 | 6.3 V.- .6A.CT. | 6.3V.- .9A.CT. | | | 2A | $4.50 |
| *T-245 | 320-0-320 | 40 | 5 V.-2 A. | 6.3V.-2 A.CT. | | | 3A | 5.00 |
| §T-201 | 0-75 | 70 | 5 V.-2 A. | | | | 2A | 4.50 |
| *T-205 | 350-0-350 | 75 | 5 V.-2 A. | 6.3V.-3 A.CT. | | | 4A | 6.50 |
| *T-206 | 325-0-325 | 100 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 2A.CT. | | 5A | 8.50 |
| T-212 | 420-0-420 | 125 | 5 V.-3 A. | 6.3V.-3 A.CT. | 2.5V.- 4A.CT. | | 5A | 9.50 |
| T-214 | 420-360-125-0-360-420 | 150 | 5 V.-3 A. | 2.5V.-3 A.CT. | 2.5V.- 5A.CT. | 6.3V.-3 A.CT. | 5A | 10.00 |
| *T-244 | 425-0-425 | 165 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | | 6A | 12.00 |
| *T-248 | 425-0-425 | 165 | 5 V.-3 A. | 2.5V.-6 A.CT. | 2.5V.- 6A.CT. | | 6A | 12.00 |
| T-213 | 520-110-0-520 | 180 | 5 V.-3 A. | 2.5V.-3 A. | 6.3V.- 3A.CT. | 6.3V.-3 A.CT. | 5A | 11.50 |
| T-215 | 360-125-0-360 | 200 | 5 V.-3 A. | 2.5V.-3 A.CT. | 2.5V.-10A.CT. | 6.3V.-2.1A.CT. | 5A | 11.50 |
| T-247 | 590-0-590 | 200 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | | 5A | 12.00 |
| T-216 | 520-85-0-520 | 250 | 5 V.-3 A. | 2.5V.-3 A. | 6.3V.- 3A.CT. | 6.3V.-3 A.CT. | 6A | 13.00 |
| †T-207 | 0-275-375 / 0-180 | 10 / 6 | 6.3V.- .6A. | 6.3V.-1 A. | 2.5V.-1.4A. | | 3A | 4.00 |
| ‡T-202 | 0-150 | 20 | 6.3V.- .6A. | | | | 1A | 4.00 |
| §T-220 | 125-0-125 | 200 | 5 V.-3 A. | | | | 4A | 6.00 |
| T-246 | 625-0-625 | 250 | 5 V.-3 A. | 6.3V.-3 A.CT. | 6.3V.- 3A.CT. | | 6A | 13.00 |

*Indicates unit designed for condenser input to filter. (All other units should be used with choke input.)
†For RCA 913 Midget Cathode Ray Tube.
‡For oscillators, wave meters, etc.
§For bias supplies.

## FILAMENT TRANSFORMERS

### Single Winding

| Type No. | F1 | F2 | F3 | F4 | Case No. | List Price |
|---|---|---|---|---|---|---|
| T-352 | 2.5 V.-10 A. CT. 2000 V. Test | | | | 2A | $4.00 |
| T-354 | 5 V.-3 A. CT. 2000 V. Test | | | | 2A | 4.00 |
| T-351 | 6.3 V.-3 A. CT. 2000 V. Test | | | | 2A | 4.00 |
| T-353 | 7.5 V.-4 A. CT. 2000 V. Test | | | | 2A | 4.00 |
| T-357 | 5.25 V.-12 A. CT. 2000 V. Test | | | | 4A | 6.00 |
| T-358 | 5.25 V.-20 A. CT. 2000 V. Test | | | | 5A | 8.00 |
| T-360 | 2.5 V.-10 A. CT. 5000 V. Test | | | | 3A | 6.00 |
| T-365 | 10 V.-4 A. CT. 5000 V. Test | | | | 3A | 6.50 |
| T-361 | 10 V.-8 A. CT. 5000 V. Test | | | | 4A | 8.00 |

### Two Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-366 | 2.5 V.-10 A. CT. 5000 V. Test | 2.5 V.-10 A. CT. 5000 V. Test | | | 4A | 8.00 |
| T-363 | 10 V.-6.5 A. CT. 5000 V. Test | 10 V.-3.25 A. 5000 V. Test | | | 5A | 9.00 |
| T-362 | 11-12 V.-8 A. CT. 5000 V. Test | 10-11 V.-3.5 A. CT. 5000 V. Test | | | 5A | 11.00 |

### Three Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-364 | 2.5 V.-8 A. CT. 750 V. Test | 2.5 V.-8 A. CT. 750 V. Test | 5 V.-6 A. 750 V. Test | | 4A | 7.00 |
| T-356 | 6.3 V.-3 A. CT. 750 V. Test | 5 V.-4 A. CT. 3000 V. Test | 5 V.-8 A. CT. 3000 V. Test | | 4A | 9.00 |
| T-355 | 5 V.-3 A. CT. 4000 V. Test | 5 V.-3 A. CT. 4000 V. Test | 5 V.-6 A. CT. 4000 V. Test | | 4A | 7.50 |
| T-375 | 2.5 V.-5 A. CT. 6000 V. Test | 2.5 V.-5 A. CT. 6000 V. Test | 2.5 V.-10 A. CT. 6000 V. Test | | 4A | 9.00 |

### Four Windings

| | | | | | | |
|---|---|---|---|---|---|---|
| T-373 | 2.5 V.-5 A. CT. 750 V. Test | 5 V.-3 A. 750 V. Test | 7.5V.-3.25 A. CT. 3000 V. Test | 7.5 V.-8 A. CT. 3000 V. Test | 5A | 9.00 |
| T-374 | 2.5 V.-5 A. CT. 750 V. Test | 5 V.-3 A. 750 V. Test | 6.3 V.-3 A. CT. 3000 V. Test | 7.5 V.-8 A. CT. 3000 V. Test | 5A | 9.00 |
| T-370 | 6.3 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 2.5 V.-4 A. CT. 750 V. Test | 5 V.-3 A. 750 V. Test | 4A | 7.50 |
| T-371 | 5 V.-3 A. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 7.5 V.-8 A. CT. 2500 V. Test | 5A | 8.50 |
| T-372 | 5 V.-3 A. 750 V. Test | 5 V.-3 A. CT. 750 V. Test | 6.3 V.-3 A. CT. 750 V. Test | 7.5 V.-4 A. CT. 2000 V. Test | 5A | 8.50 |
| T-367 | 6.3 V.-5 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 5 V.-6 A. CT. 2000 V. Test | 5 V.-3 A. CT. 2000 V. Test | 5A | 9.00 |

### Five Windings

| | F1 | F2 | F3 | F4 | F5 | | |
|---|---|---|---|---|---|---|---|
| T-377 | 5 V.-3 A. 2000 V. Test | 5 V.-6A. 2000 V. Test | 6.3 V.-1 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 6.3 V.-5 A. CT. 2000 V. Test | 5A | 9.50 |

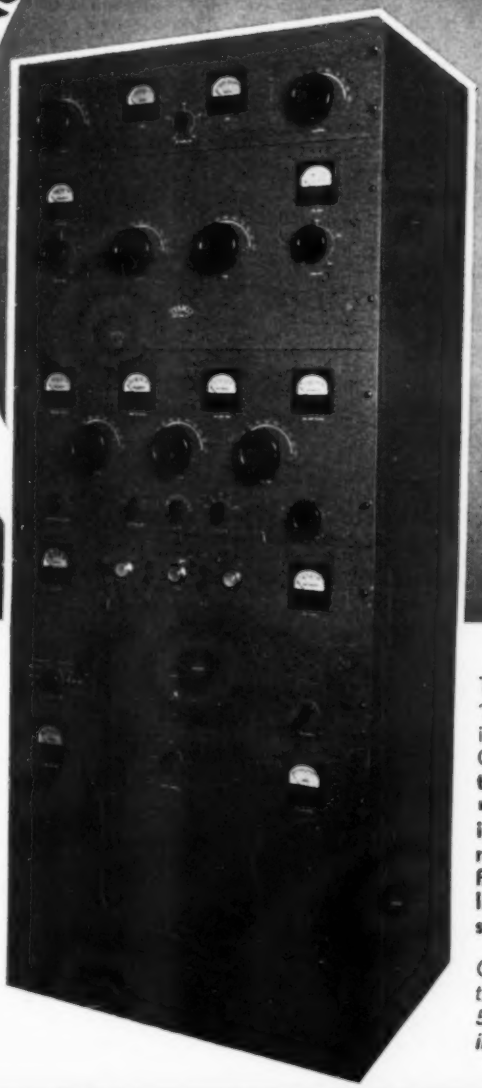
*Prices subject to change without notice*

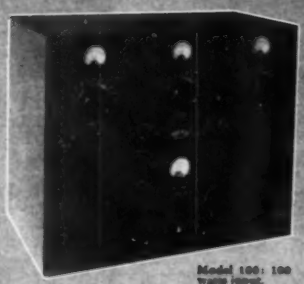

Our new 64 page transmitter manual contains complete up-to-date transmitter circuits ranging in size from 5 watts to one kilowatt.
14 pages are entirely devoted to full page Ken-O-Grafs which cover most of the calculations used in radio in a modern and painless method.
This book which should be in the possession of every amateur is no subterfuge for a catalog.
*To obtain your copy see your local dealer or send 25 cents in coin or stamps to*
KENYON TRANSFORMER CO., INC. 840 BARRY ST., NEW YORK, N. Y.

# ANNOUNCING TEMCO, - A NEW STANDARD OF EXCELLENCE

in

## TRANSMITTER CONSTRUCTION & PERFORMANCE





Model 100: 100 watts input.

Model 1000: 1 K.w. input, push-pull, HF 100's Class "C" stage.

Andy Sannella, W2AD, well-known NBC & CBS orchestra maestro shown with his TEMCO 1000 watt transmitter.

The new line of TEMCO transmitters from 100 to 1000 watts, offers many new features resulting in increased efficiency and convenience of operation. Compare these salient features ▪ **Band switching up to and including grid circuit of final amplifier stage ▪ Automatic plug-in chassis with conduit-protected inter-cabling ▪ Full remote control ▪ Complete relay protection ▪ Separate hi-fidelity speech amplifier unit including 2 channel mixer ▪ 100% high level modulation ▪ 6 position crystal selector switch ▪ Operation from 1.7 mc. to 30 mc.**

*Complete and illustrated technical data sheets on these as well as TEMCO Transmitters of 350 and 500 watts input will be sent on request. Address inquiry attention W2KR.*

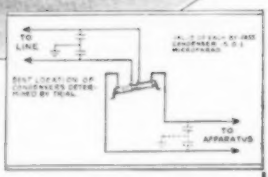
TEMCO

**Transmitter Equipment Manufacturing Co., INC.**

150 CEDAR STREET • NEW YORK, N. Y.

*Designers and Manufacturers of Radio Transmitting and Accessory Equipment*

Announcing!




OHMITE
POWER LINE
CHOKES

FOR PREVENTING INTERFERENCE
FROM HIGH FREQUENCY CURRENTS

★ Again OHMITE is first with the latest! These new solenoid-wound power line chokes score bull's-eyes in two directions—first in preventing high frequency currents from going *out* over power lines from radio transmitters, and second, in preventing high frequency currents from coming in over power lines to radio receivers. They are not recommended for use in preventing interference of audio frequency.

★ The three Ohmite Power Line Chokes shown in the illustration at the top of this page are designed primarily for amateur transmitter use. The Z-20 Choke, rated at 5 amperes, is designed to take care of low-powered transmitters. The Z-21 Choke is rated at 10 amperes and is recommended for use in medium-powered transmitters. The Z-22 Choke is rated at 20 amperes and is designed for use on high-powered transmitters. For transmitters or other high frequency apparatus drawing more than 20 amperes, special chokes can be made up to specifications.

★ On account of its small size the Z-20 Choke is also specially suitable for use on radio receivers — in preventing interference from nearby high frequency sources from coming in to such sets over the power lines. For this reason this choke is particularly desirable to use in working duplex in amateur radio station operation.

★ An Ohmite Power Line Choke and condensers, serving as a filter, is shown in the diagram above. The condensers may be 0.1 microfarad units, rated at approximately twice the line voltage. For further information on these new Ohmite Power Line Chokes see your dealer or send for Bulletin 105.

OHMITE
MANUFACTURING COMPANY
4831 Flournoy St. Chicago, Ill.
*Manufacturers of Resistors and Rheostats of All Types*

## Correspondence Dept.

(*Continued from page 66*)

This week on the same band I heard a well-known W8 in a perplexed mood complaining in Italian to a friend that his tubes were showing color with *only* 1000 watts, while they ran perfectly cool when he ran 'em at 1500 watts.

And to top it all off, to-night two of the kilowatt boys discussed at length the terrific QRM being caused by another ham who was on their frequency and running a good solid kilowatt of his own.

This latter discussion terminated with the remark to the effect that "Well, when kilowatt bucks kilowatt I guess nothing much gets through."

I am asking you, Mr. Editor, is this a system?

I figure that with my little half-kilowatt bottle in hock, I can buy a couple of rare Abyssinian stamps or get a good b.c.l. receiver. At least, the high-powered stations on the b.c. bands put on some good entertainment.

—*Larry Evans, W2BBK/3*

## Lightning on Ten

Room 1020, Civic Center Bldg., Los Angeles, Calif.

Editor, *QST:*

I noticed a rather odd phenomenon on the 10-meter band during a recent thunderstorm that may be of interest.

At the time of observation, I was working a 'phone station in the 8th district with R8 signals both ways. The weather had been cloudy with some rain for the past 12 hours. As the warm front of the storm approached from the east (directly in the path of our signals) it developed several lightning flashes and heavy thunder. The lightning was quite some distance away and produced the usual static crack in the receiver with no effect on the R8 signal. After a pause of possibly two to five seconds the R meter on the Breting receiver started a dance that about took it out of its mounting. The R8 signal went up to about R10 and with a rapid fade to 0 and back to maximum. This condition of a very rapid fade continued until the thunder was heard audibly. This same condition repeated itself following each flash of lightning during the entire afternoon and only effected the eastern signals with the K6's coming through unaffected.

The above noted condition was possibly a result of the turbulent condition of the lower atmosphere caused by the heavy vibration of the thunder clap—or sumpin'—signals bent in the atmosphere, etc. Hi!

This condition may have been observed before but it was a new experience to me and I am passing it to you in case it should bear checking.

—*Maurice E. Kennedy, W6BGC, W6KQ*

## Ham Binges

465 Franklin Ave., Hasbrouck Heights, N. J.

Editor, *QST:*

What do you think of the enclosed clipping?

I think it's too bad a few use such poor judgment, especially after several warnings issued through *QST*.

Why should we amateurs stand for it? I would suggest any one hearing such make a complete log of it and get as many witnesses as possible. Then send it to A.R.R.L. to be published or to be used as the Board deems it best.

The writer is not a dry, but I do enjoy the privilege of amateur radio.

—*Charles Ratcliffe, W2DMN (W1INS)*

EDITOR'S NOTE.—The clipping referred to is an excerpt from Zeh Bouck's column in the *New York Sun* for Saturday, October 17th. It reads:

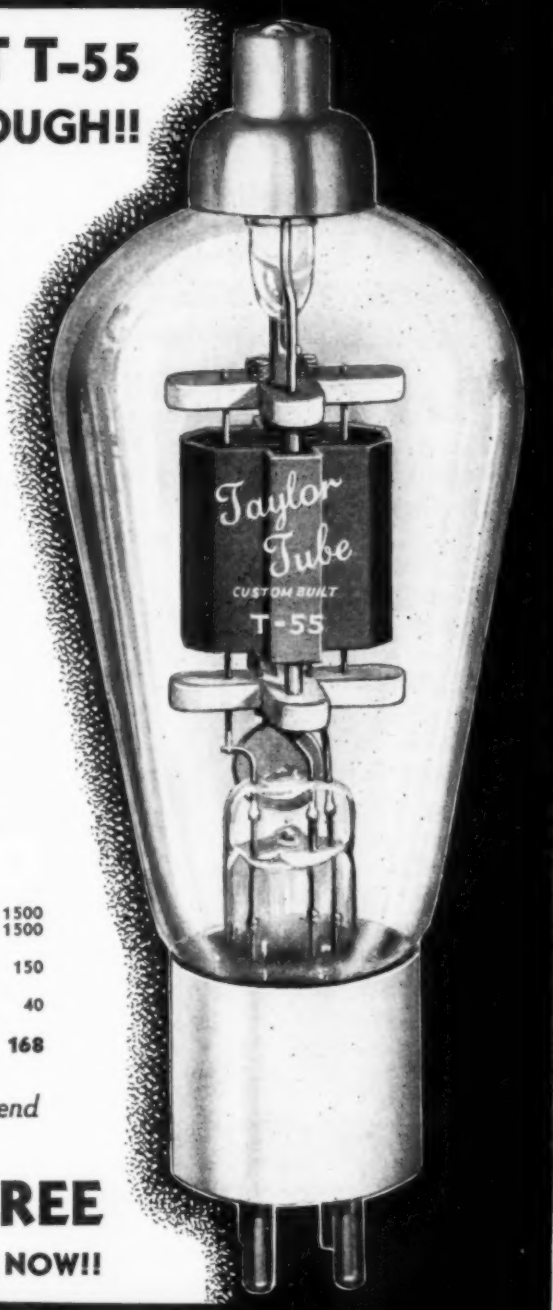
"We tuned in the other evening to our first ham binge—a ham binge being a jollificasion when two amateurs get together and stage drinking parties on their respective ends of the ether. We're happy indeed to learn that the amateurs can find some useful way in which to spend their time between floods and hurricanes. However, we fear that some of them may turn out to be has-beenges—as the language used during the latter portions of the parties is not always in accord with the F.C.C. rules and regulations. The festivities start with a few 'hi hi's,' getting high higher and ending up by being hi hilarious. The hams apparently drink nothing but gin and ginger ale preferably without ginger ale. (Along

# Taylor HEAVY CUSTOM BUILT DUTY Tubes

## TAYLOR'S GREAT T-55 AGAIN CRASHES THROUGH!!

Once more Taylor takes pleasure in announcing new and improved ratings for the champion transmitting tube — the mighty T-55. Taylor has led the way. The ideal of "More Watts Per Dollar" has given the amateur quality tubes at the prices Taylor pioneered. We are proud of your loyalty and pledge our continued adherence to this policy.

**T-55 ONLY $8.00**




### LOOK—CHARACTERISTICS—LOOK

**Class "B" Audio Push Pull Operation**

| | |
|---|---|
| Filament Voltage | 7.5 |
| Filament Current, amps | 2.0 |
| Mutual Conductance Micromhos | 2200 |
| Amp. Factor | 20 |

**Class "B" Operating Conditions**

| | | | |
|---|---|---|---|
| Plate Voltage | 1000 | 1250 | 1500 |
| Plate to plate load, Ohms | 6900 | 9400 | 12000 |
| Average D. C. Plate Current — 2 tubes | .285 | .280 | .275 |
| Grid Voltage, appr. | 45 | 55 | 65 |
| Static Plate Current (per tube) Mils. appr. | 20 | 20 | 20 |
| **Power Output Watts** | **175** | **225** | **275** |

**Class "C" Tube Characteristics**

| | |
|---|---|
| Max. Plate Volts Unmodulated D. C. | 1500 |
| Modulated D. C. | 1500 |
| Max. D. C. Plate Current M. A. | 150 |
| Max. D. C. Grid Current M. A. | 40 |
| **R. F. Output Watts** 75% *Efficiency* | **168** |

*All leading radio parts distributors recommend TAYLOR TUBES*

**FREE** Big new TAYLOR TUBE catalog and handbook No. RN **FREE**

*See your parts distributor or write us* **NOW!!**

*"More Watts Per Dollar"*

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS

# NEW— ECONOMICAL— GET 120 WATTS AUDIO POWER

from push-pull parallel

— ⟨ 6L6 6L6 / 6L6 6L6 ⟩ =

TUBE COMBINATION

The JEFFERSON laboratory has engineered an amplifier circuit which delivers 120 watts of audio power using the above tube combination.

Development of this circuit was prompted by the success of the JEFFERSON 60 watt P.P. 6L6 amplifier published a few months ago, which, for the first time, made it possible to realize the full output of these tubes.

*Plate Transformer No. 465-261 For 120-Watt Amplifier*

Every amateur will be interested to learn how easy and economical it is to construct this amplifier and get 120 watts of audio power.

Send for Bulletin PA-13. JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. Canadian Factory: 535 College St., Toronto.

JEFFERSON TRANSFORMERS

**Jefferson Electric Company**
**Bellwood, Illinois**

Send full information on circuit and Jefferson Transformers for the 120-watt Audio Power 6L6 Tube combination.

*Name* .....

*Address* .....

*City and State* .....


**The Wine Trail: Please note and do something about it.)"**

***QST* is appalled to learn (1) that such are hams' drinking habits, (2) that such is their drink. Needless to say, this practice cannot be too emphatically condemned, nor can its individual and collective danger be over-emphasized.**

**Thanks also to others sending in this clipping, and a word, by-the-way, to all readers: A.R.R.L. maintains no press-clipping service. We depend on ham friends throughout the country for clips from newspapers and other publications concerning ham matters. It is greatly appreciated, therefore, whenever items of ham publicity, whether favorable or otherwise, are forwarded to us.**

---

107 Berteau Ave., Elmhurst, Ill.

Editor, *QST:*

**. . . Another great black eye to the amateur is these drinking parties over the air. This surely gives the broadcast public a bad opinion of amateur radio. Then when a little b.c.l. trouble comes up he dislikes the amateur more and so he writes the F.C.C. about the condition and when we ask for more frequencies they say we can't have them because we cause too much trouble to the broadcast listening public. . . .**

*—Robert B. Schmidt, W9SZO*

---

## The Editor's Mill

*(Continued from page 8)*

held by the F.C.C. in Washington, where every radio interest was required to display what uses were being made of its frequencies and what its requirements were for satisfactory service in the future. A.R.R.L. staged a comprehensive presentation for the amateur which was widely hailed as the most instructive demonstration presented by any service. Representing weeks of work by staff members, and illustrated by colored charts, it dramatically told the vast national merits of organized amateur radio with heavy emphasis on its contributions to the art and to the community; it graphically displayed the state of our congestion and incontrovertibly established the reality of our need for more frequencies; it made substantial contributions to ultra-high-frequency knowledge which are claimed as useful in the eventual allocation to services of the frequencies above 30 Mc., and clinched the case for a continuing family of amateur bands in the u.h.f. region—an issue on which no announcement had been made as the year approached its end.

A.R.R.L. headquarters kept constant contact with Washington during the year, adjusted scores of small difficulties. In a test case on the portable regulations the League successfully defended a member accused of violation, precipitating a clarification of the portable regulations which is soon to appear. During the year the number of licensed amateur stations in the country increased about 3%, passing the 47,000 mark.

In the Dominion of Canada, amateur development kept strictly apace that of the States. It has had a flourishing year, attaining the greatest numbers in its history. Excellent relations between Canadian amateur radio and the government at Ottawa were maintained by the League's Canadian General Manager, but the administration refused to embrace the desire of Canadian amateurs for more frequencies at Cairo, the same as did the United States government.

In the world of international amateur radio,

# Season's Greetings to all our Friends

## Type 50-TK Transmitter

Fifty watts output from the final push-pull 6L6 stage. The tube line-up is 59 Tri-tet crystal oscillator, latest type quadrupling circuit, link coupling used, fixed neutralization. Panel, 8¾", chassis 8". Complete in kit form with one set of coils..... **$23.95**

**Type 50-TB Transmitter** — Wired by our Laboratory. **$31.95.** Power supply 500-PB is used with the 50-TB. Additional coils for the 50-TK, **$3.00 per set.**

**Combination Type 50-TBC Transmitter** — Crystal and holder, 59 and two 6L6G tubes, Sylvanias.....**$37.15**

Type 50-C — as above, complete with 500-PB power supply and 83 tube....**$51.00**

## LEEDS BAND WAGON SPECIALS

Made on chassis with protecting grill. 32 watt high fidelity push-pull 6L6 amplifier, high and low impedance input — 2% distortion. Output impedance 2, 4, 6, 8, 15 v.c. 200 and 500 w. line.....**$28.75**

Same 32 watt amplifier with modulation transformer (will modulate 64 watt R.F. load).....**$31.75**

Set of 6 matched Sylvania metal tubes, **$4.49**

1 Wright DeCoster No. 1590 — 12" speaker, **$7.80**

1 Astatic D-104 microphone.....**$13.23**

1 Floor stand (adjustable 67").....**$3.95**

## COMPLETE SOUND SYSTEMS

32 watt amplifier, two No. 1590 WDC speakers, Astatic crystal microphone, and 2-20" sound projectors.....**$68.95**

**SPECIAL** — 11 watt 6L6 amplifier, high and low impedance input.....**$14.50**

Set of 4 matched Sylvania metal tubes, **$2.73**

Complete 11 watt unit, tubes, Wright DeCoster No. 990 speaker, Bell projector, crystal microphone.....**$39.95**

---

**NOISE SILENCER ADAPTERS** are a great help on reducing natural static too. LEEDS "QUIET CAN" and "SILENT CAN" also provide freedom from ignition noises and afford an ideal arrangement for push to talk phone and break-in CW.

**LEEDS "Quiet Can"** for receivers with 2 IF stages; complete with tubes and instruction..... **$7.95**

**LEEDS "Silent Can"** illustrated herewith, for receivers with 1 IF stage; complete with tubes and instructions **$9.95**

---

## RELAY RACKS RACK PANELS BASES AND DEMI BASES

**for sizes, complete descriptions and prices, see our advertisement in November issue**

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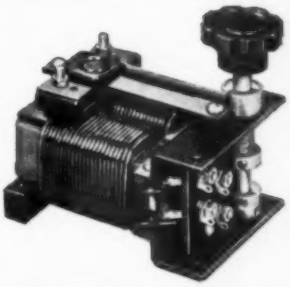
## We Are Headquarters for the Following

**Hammarlund — Meisner — Alladin — Triplett — Littelfuse — United Transformer — Cornell-Dubilier — Thordarson**



## GENERAL RADIO Variac Transformers

A wonderful line voltage control, that is smaller, more convenient to use and furnishes high current over a narrow voltage range.

**Type 70-B** — 115 v. at 2 amps.....**$10**

**Type 80-B** — 115 v. at 7.5 amps.....**$15**

*Write for Bulletin 67-Q for complete data*

Here are two handy G.R. forms for that multiband transmitter.

**Type 677-U** — 21 turns, 2½" diameter, resonant on 3.5 mc with 100 mfd. capacity; shipping weight 2 lbs. Price.....**50c**

**Type 677-Y** — 30 turns 4" diameter, resonant 1.7 mc with 100 mfd. capacity; shipping weight 3 lbs. Price.....**75c**

Also 7-pin base to fit above forms at 70c and a matching base with jacks at 65c.

**G.R. 247M** — .00025 condensers.....**49c**

**G.R. Amateur accessories always in stock**

---

## AEROVOX
### OIL IMPREGNATED CONDENSERS

| | | | |
|---|---|---|---|
| 1 mfd. 1000 v.. | $1.59 | 1 mfd. 1500 v.. | $1.67 |
| 2 mfd. 1000 v.. | 1.97 | 2 mfd. 1500 v.. | 2.30 |
| 4 mfd. 1000 v.. | 2.85 | 1 mfd. 2000 v.. | 2.09 |
| 2 mfd. 2000 v.. | $2.79 | | |

Electrolytic and tubular condensers in stock

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## TRIPLETT METERS

**All standard ranges; 0-10 to 0-1000 MA**

**3½" bakelite case**.....**$3.75**

**2" bakelite case**.....**$2.94**

**READRITE** milliammeters 15 to 400 mills; any range, each.....**59c**

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**TRIMM** 2000 ohm phones.....**$1.80**
4000 ohm.....**$2.25**

**TRIMM** featherweight.....**$5.88**

DX 20,000 ohm imp.....**$2.65**

**WESTERN ELECTRIC,** type P-11...**$3.95**

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## ALL SYLVANIA RECEIVING TUBES at 50% off list price

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LEEDS
*The Home of RADIO*

## LEADS THE FIELD

World Wide Service to Amateurs

45 Vesey Street
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*Cable Address:* **"RADLEEDS"**

## Important Announcement

**On Our NEW LD-5 Mounted Crystals**

These low drift plates, factory sealed in the new LEEDS metal holder are outstanding from the standpoint of stability, accuracy, high output and low cost. Low Drift — 5 cycles per million per degree. Accuracy of calibration — better than .05%. Orders filled plus or minus two kc. of specified frequency. Last but not least, the price of the mounted crystals, anywhere in the 160 80 and 40 meter band is only... **$3.50**

Money back guarantee if you are not completely satisfied.

LEEDS type A.L. metal crystal holder, as illustrated above, fits standard 5-prong socket.....**89c**

---

## NATIONAL

**NC 100 — NC 100 X and 101 X**

**Hammarlund "Pro" and "Super-Pro"**

Sold on time at cash prices in Metropolitan area. No down payment.

Liberal allowance on your old set.

We carry the complete line of NATIONAL and HAMMARLUND.

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## NAVY TYPE TELEGRAPH KEY

List $3.60. Navy knob — ¾" Tungsten contacts. While they last.....**$1.15**
With regular knob.....**95c**

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## HAMMARLUND "STAR" MIDGET CONDENSERS

A dandy variable condenser for receiving, transmitting, short wave tuning, verniers, etc., — the usual Hammarlund high quality, at unusually low prices.

| *Type* | *Mmf* | *Price* |
|---|---|---|
| SM-15 | 15 | .50 |
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| SM-50 | 50 | .53 |
| SM-100 | 100 | .59 |
| SM-140 | 140 | .73 |
| SM-35-X | 35 | .59 |
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complete with 1 slider

**100 w. 6½" x 1¼"**

| | |
|---|---|
| 500 — 1000 — 2500 — 5000 ohm | $1.15 |
| 10,000 to 25,000 ohm | 1.30 |
| 30,000 — 40,000 — 50,000 ohm | 1.40 |
| 60,000 — 75,000 — 100,000 ohm | 1.55 |

**200 w. 10½" x 1¼"**

| | |
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| 500 to 10,000 ohm | 1.75 |
| 15,000 to 100,000 ohm | 2.00 |
| *Extra taps, each* | 9c |

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**The record is 100% perfect. Thousands of microfarads of LEEDS OIL FILLED CONDENSERS are in use without one case of failure.**

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the year 1936 was one of notable accomplishment. The International Amateur Radio Union added two new member-societies to its roster, bringing the total to 27. Its strength and prestige in international affairs mounts steadily. More than 700 W.A.C. certificates were issued by the Union through the year. Extensive preparations for the 1937 Bucharest C.C.I.R. meeting and preliminary discussions for the 1938 Cairo conference were carried on during the year. In preparation for the C.C.I.R., the Union contributed technical studies on several of the questions on the agenda of which amateurs have a peculiar knowledge, and plans were made for active representation at the conference itself by the adoption of an arrangement wherein the member-societies of the Union share the costs of amateur participation. Practically without exception there was increase in both the numerical strength and the organizational activity of the member-societies. Evidential of one phase of this enhanced activity is the growing number of international contests being sponsored by various societies—a new manifestation of the thoroughly universal international spirit of amateur radio around the world.

—...—

As the year draws to a close and this issue of *QST* slips into the mail, we at A.R.R.L.-I.A.R.U. headquarters would like to embrace this opportunity to send to every ham our warmest wishes for a Merry Christmas, a Joyous New Year, health and plenty, and complete success in radio endeavors! Here's to 1937!

K. B. W.

## Midwest Division Convention

DEMONSTRATION of RCA's new X-488 "multitube" for amateur transmitters held the spotlight at the annual Midwest Division convention at the Hotel Kansan, Topeka, Kan., October 17th and 18th, with Prof. Adolph Munster, of Ivanhoe college, Harrisonville, N. J., as demonstrator.

Enthusiasm ran riot when Dr. Munster explained that with this new tube "you will need only one tube between power main and antenna, for this tube is a rectifier, an oscillator and a one-kilowatt amplifier, all in one envelope. It will be sold to the general amateur at only $25."

Then an amateur stepped forward—he fumbled—and the tube, the only one of its type in existence, crashed in a thousand pieces on the floor!

Dismayed gasps changed into a roar of laughter as the convention realized it had been hoaxed.

Starring in his characterization of an eminent scientist, Dr. Munster, was Art Kimball, ex-9RY, of Topeka, staging a comeback in the "ham" game after many years' absence. The tube was specially manufactured for the Kaw Valley Radio Club, Topeka, convention hosts, by RCA-Radiotron, Inc., of which company John C. Warner, former Topekan, is vice-president.

But that was the only hoax in a busy-two-day program. Technical talks in general sessions were

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MODEL 1295

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Scale indicates modulation from 40 to 120 per cent. All readings in peaks. Visual information on second dial provided for carrier reference level for the modulation test and also to check carrier shift during modulation. All uncertainties regarding final adjustments on the transmitter eliminated with the use of Triplett's Modulation Monitor. Prevents monkey chatter, cross talk and B.C.L. interference. Factory calibrated and no further calibration needed.

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High μ
High Gm
High voltage handling ability
High frequency oscillator
High power output
LOW IN PRICE

This tube delivers a satisfactory power at ultra high frequencies and is, in addition, a remarkably efficient modulator and amplifier both in the amateur and broadcast bands.

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outstanding, with H. F. Pitzer, of Kansas City, Mo., field engineer for RCA, demonstrating a talk on "X-Raying Amateur Transmitters With the Cathode Ray Oscillograph"; W. A. Beasley, W9FRC, of the host club, presenting a paper, "Your Sky Wire and Mine," prepared for the convention by R. S. Kruse, W1FG, of Guilford, Conn.; Jay Wilcox, W9CUN, of Kansas City, Mo., discussing "The Doherty Circuit, Bell Laboratories' New Linear Amplifier"; and Clark C. Rodimon, W1SZ, of League headquarters, discussing "New Developments in Amateur Radio."

Floyd E. Norwine, Jr., W9EFC, St. Louis, Mo., Midwest Division director, was in charge of the League business session. O. J. Spetter, W9FLG, Topeka, alternate director, was introduced.

Norwine announced appointment of Beasley, W9FRC, Topeka, and William Graham, W9BNC Omaha, as assistant directors for Kansas and Nebraska, and reported League activities and plans, reviewing board actions. F. K. Tiffany, N9DEB, K.V.R.C. president, conducted convention sessions. The midnight initiatory ritual of the Royal Order of Wouff-Hong, staged by the O.B.P., Kansas City, was featured.

To H. B. Unruh, W9AWP, of Wichita, was presented the Kansas Wouff-Hong trophy for 1936, the Wichitan having been voted by fellow Kansas "hams" as the state's outstanding amateur operator for the year.

Wichita will be host to the Kansas state convention next spring; the H.A.R.C. and O.B.P., Kansas City, Mo., will be hosts to the Midwest Division convention next fall.

—*N9DEB*

## The 1936 Central Division Convention

OVER Labor Day week-end at the invitation of the Chicago Area Radio Club Council, nearly 1600 amateurs gathered in the Sherman Hotel, Chicago, for the 1936 Central Division Convention.

Saturday morning was given over to registration and visiting the equipment show. Some very interesting movies of League headquarters and officials and other conventions were shown by our director. The program officially started at 1:00 P.M. with introductions of the newly-elected president and vice-president of the League by Director Roberts. Both Messrs. Woodruff and Bailey made short but interesting talks on the League and its future. After a short recess, the gang re-convened for an "open forum" session. By acclamation the convention adopted resolutions prepared by a committee appointed some weeks in advance by the convention management, intended to inform the director of division opinion on matters of the day. The resolutions called for splitting the Central Division to make a new division of Wisconsin and Illinois; moving A.R.R.L. headquarters to Chicago; appropriating more funds for membership contact by director and alternate director in the Central Division; sending "Sumner B. Young, W9HCC, or some

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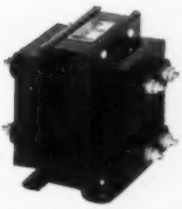

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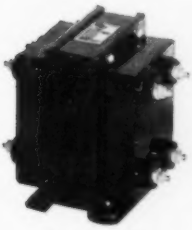

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Capacity V. A. 1000
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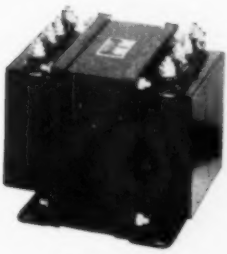

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one of his calibre" as a third member of the amateur delegation to the Cairo Conference; making funds available for conferences of director, alternate, assistants and S.C.M.'s; holding the next meeting of the Board in Chicago.

Saturday night was turned over to Mr. Thorne Donnelley and his W9PZ Club as a general "get-together" and "meet-your-neighbor" night. Stars from the broadcasting studios were there to entertain. Over 25 barrels of beer helped make the evening a success. The hotel estimated an attendance of over 2300 at this party. Prizes were also given away.

Next morning, though not very early, the A.A.R.S., N.C.R., 'Phone, C.W., Traffic, DX and Five-Meter groups, under the leadership of a notable from each field, discussed problems peculiar to their particular phase of ham radio. W2AMJ, W9ZN, W9KA, W9AA, W9CGV, W9KJY and Maj. Eliott were presiding officers.

Sunday afternoon, Ted McElroy, world's code-speed champion, gave an amazing demonstration of high-speed copying and water drinking. John Reinartz gave his usual interesting talk. Following a short recess, Fritz Franke's "inside" dope on the operation of airways radio, and Boyd Phelps and his "dry" humor, together with demonstrations of new and novel apparatus, had the gang on the edge of their seats.

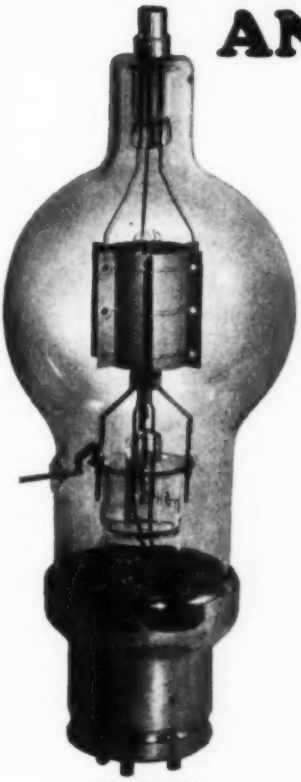
Sunday evening produced the crowning event of the entire affair—the banquet. When the last course was finished, Toastmaster Mathews, W9ZN, began the program. A.R.R.L. officials and other notables were introduced—some said a few words, but more often they simply took a bow. Dr. Lee de Forest, well known to all amateurs as the inventor of the radio tube, gave a most engrossing account of his experiences. Immediately thereafter, Dr. Woodruff, on behalf of the Chicago Area Radio Club Council, presented Dr. de Forest with a medal bearing the inscription, "Presented to Dr. Lee de Forest by the radio amateurs in appreciation of his contributions to the radio science," applauded by the entire delegation.

George Givot, the "Grik Ambassador," and his famous College Inn band, amused the audience with wise-cracks and singing and comedy acts. A magician mystified the crowd with his sleight-of-hand tricks. Eugene Hubbell, W9ERU, was presented with a beautiful trophy in recognition of victory in the code-speed contest held earlier in the day. Hubbell copied 52.7 w.p.m. with only one error. "Dr. Anton Carlson," introduced as "SM-I-TH" from Stockholm, Sweden (who was "Alex Christiansen of Chicago and never saw Sweden"), had the gang rolling in the aisles. At the conclusion of the festivities, prizes were awarded, some of the larger ones being half-kilowatt tubes, several receivers, and a grand prize of a half-kilowatt transmitter.

Although arising late again Monday morning, the delegates found many events still scheduled. Mr. Mims, W5BDB, described his "signal squirter." Dr. Andrew and Mr. Vandervier were highly applauded for their technical talks.

(*Continued on page 88*)

# EIMAC PRESENTS THE 100T AND 250T TUBES



EIMAC 250T

## FEATURES

▶ IMPROVED ANODE CONNECTOR
Eliminates high losses present in common type of connectors. Consists of three solid copper bars terminating in a solid copper button. Button does not touch glass allowing free circulation of air around stem.

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Vertical bar grid. High $\mu$ plus a real saving in grid driving power.

▶ IMPROVED THORIATED TUNGSTEN FILAMENT
Much higher thermionic efficiency plus longer life.

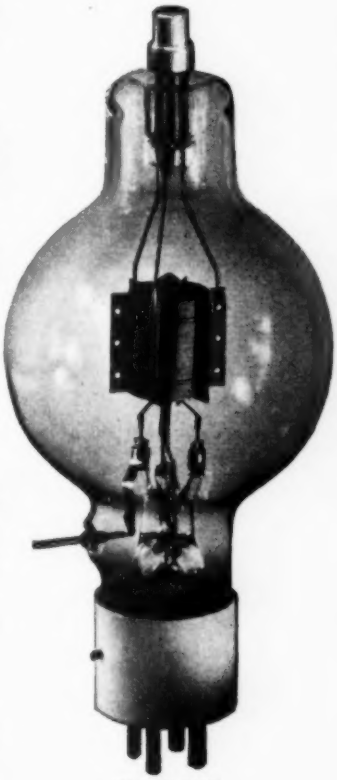
▶ PRACTICAL FILAMENT SUPPORT
Allows perfect filament alignment, prevents filament distortion without the use of ceramic insulators.

▶ STILL GREATER GRID INSULATION
Improved stem allows greater r.f. grid voltages essential for efficient power frequency multiplication.

▶ IMPROVED GRID CONNECTOR
Solid tungsten rods reduce r.f. losses nearly 50% at this point.

▶ IMPROVED PERFORMANCE
Subtle refinements in manufacturing technique and in tube design have given these new EIMAC tubes truly startling performance capabilities.

And of course sparkling clear bulbs, perfect vacuum, perfectly aligned elements, plus EIMAC's guarantee of complete freedom from gas released thru accidental overload.



EIMAC 100T

## RATINGS

| 250TL (low $\mu$) 250TH (high $\mu$) | 100TL (low $\mu$) 100TH (high $\mu$) |
|---|---|
| Fil. 5 v; Fil. Cur. 10.5 amps; Plate volts 1000 to 3000; Plate cur. 350 milliamperes; Plate diss. 250 watts. | Fil. 5 v; Fil. cur. 6.5 amps. Plate volts 1000 to 3000; Plate cur. 225 milliamperes; Plate diss. 100 watts. |
| Class "C" output up to 800 watts (75% eff.) | Class "C" output up to 400 watts. |
| Class "B" audio (Two tubes) 1000 watts. | Class "B" audio (two tubes) 425 watts. |
| Net $24.50 | Net $13.50 |

The 250TH and the 100TH (high $\mu$) are preferred over the 250TL and the 100TL (low $\mu$) for practically all work especially class "C" r.f., Class "B" audio, and frequency multiplying circuits because of the ease in which the high $\mu$ tubes are excited.

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## The 1936 Central Division Convention

*(Continued from page 80)*

Dr. Woodruff's "Bag o' Tricks" was received with the usual enthusiasm. The convention officially closed at 1:00 P.M. to allow those who came from long distances to return home and "put the kids in school" the next morning. Many stayed over, however, to visit N.B.C. studios, attend various outside events, or chew the fat with others.

A special program was arranged for the women which included, at the expense of the Council, a theatre party, card parties, and a troupe of professional dancers.

The trade show, at which over $80,000 worth of strictly amateur apparatus was on display, was open all during the Convention. Practically all of the leading manufacturers had displays and many new items were introduced. This trade show was the largest exhibition of amateur apparatus ever assembled.

—*W9KJY*

## Standard Frequency Transmissions

| *Date* | *Schedule* | *Station* | *Date* | *Schedule* | *Station* |
|---|---|---|---|---|---|
| Jan. 8 | B | W9XAN | Jan. 29 | A | W6XK |
| | B | W6XK | Feb. 5 | B | W9XAN |
| Jan. 13 | C | W9XAN | | B | W6XK |
| Jan. 15 | B | W9XAN | Feb. 10 | C | W9XAN |
| | A | W6XK | Feb. 12 | B | W9XAN |
| Jan. 20 | BB | W9XAN | | A | W6XK |
| Jan. 22 | BB | W6XK | Feb. 17 | BB | W9XAN |
| | A | W9XAN | Feb. 19 | BB | W6XK |
| Jan. 23 | BX | W6XK | | A | W9XAN |
| Jan. 24 | C | W6XK | Feb. 20 | BX | W6XK |
| | | | Feb. 21 | C | W6XK |
| | | | Feb. 26 | A | W6XK |

STANDARD FREQUENCY SCHEDULES

| *Time* (*p.m.*) | *Sched. and Freq. (kc.)* *A* | *B* | *Time* (*p.m.*) | *Sched. and Freq. (kc.)* *BB* | *C* |
|---|---|---|---|---|---|
| 8:00 | 3500 | 7000 | 4:00 | 7000 | 14,000 |
| 8:08 | 3600 | 7100 | 4:08 | 7100 | 14,100 |
| 8:16 | 3700 | 7200 | 4:16 | 7200 | 14,200 |
| 8:24 | 3800 | 7300 | 4:24 | 7300 | 14,300 |
| 8:40 | 4000 | | 4:32 | | 14,400 |

| *Time* (*a.m.*) | *Sched. & Freq. (kc.)* *BX* |
|---|---|
| 6:00 | 7000 |
| 6:08 | 7100 |
| 6:16 | 7200 |
| 6:24 | 7300 |

The time specified in the schedules is *local standard time at the transmitting station*. W9XAN uses Central Standard Time, and W6XK, Pacific Standard Time.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes divided as follows:

2 minutes—QST QST QST de (station call letters).

3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W9XAN is "O"; and that of W6XK is "M."

1 minute—Statement of frequency in kilocycles and announcement of next frequency.

2 minutes—Time allowed to change to next frequency.

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*Write for Bulletin 69*

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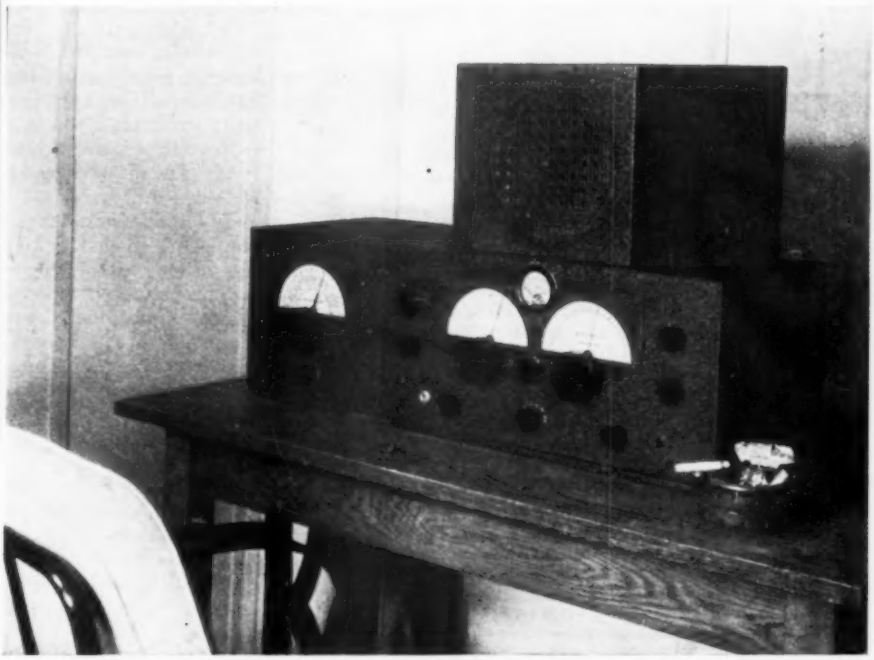

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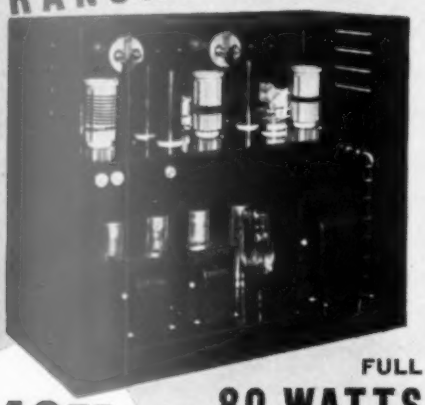

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## Schedules for WWV

EACH Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station WWV will transmit on three frequencies as follows: noon to 1:00 p.m. E.S.T., 15,000 kc.; 1:15 to 2:15 p.m., 10,000 kc.; 2:30 to 3:30 p.m., 5000 kc. On each Tuesday and Friday the emissions are continuous unmodulated waves (c.w.); and on each Wednesday they are modulated by an audio frequency. The audio frequency is in general 1000 cycles per second.

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## The Seventeenth Pacific Division A.R.R.L. Convention

CALIFORNIA is a land apart from all others—like no other, distinctively itself. It hangs upon the walls of the world like a flame of jeweled tapestry, a sky of turquoise over it, warm with the glow of sun by day, and soft and tender with the moon and stars by night.

With warm tropical breezes singing their way through trees, where watts drop gently out of transmitters, with the cool breeze of the blue Pacific Ocean peacefully rolling onto glistening white sands, we come across the beautiful city of Oakland, the home of the Oakland Radio Club, Inc., host to the 17th Pacific Division A.R.R.L. Convention which convened at the Hotel Leamington on September 5th, 6th and 7th.

It was voted by the Chamber of Commerce, City of Oakland and Alameda County, the Hotel Leamington, Police Department, etc., the most ideal and best organized convention ever to visit our fair city. Our Club alone spent nearly $4000 for the entertainment and pleasure of our visitors, besides the many thousands of dollars spent by the guests themselves, we were still able to stay out of the red financially. Four other hotels were called upon to take care of the mass of humanity which came from the plains of Texas, Missouri, Oregon, Washington, Utah, Nevada, Arizona, Hawaii, California, and last but not the least, Byron Goodman from Connecticut.

Over 700 visitors from outside of the Bay District brought our attendance to around a thousand. Our Bay cities were to blame that we did not reach our goal of 1500, as there were more from Los Angeles than from San Francisco, which is only 5 miles from our convention.

It was necessary to charter 16 private coaches to take care of our sight-seeing trips on Sunday afternoon. The brewery trip on Saturday afternoon will long be remembered with private chartered coaches busy all afternoon with taxi service. Our two dances, especially the one held on Sunday evening, were gorgeous affairs. Soft, sweet music from a ten-piece orchestra, with beautiful lighting effects and all the food one could eat, made this a gala event.

Our guest speakers were outstanding; all the usual convention highlights were successful and displays of the manufacturers were stupendous. On Monday evening a thousand persons started to fill the beautiful Scottish Rite Temple on Lake Merritt for our final banquet, the last evening of our Convention, a sight never to be forgotten will

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When the Harvard University—M.I.T. solar eclipse expedition went to Ak-Bulak, U. S. S. R., the most modern equipment available was taken with them. Included in this equipment was a complete supply of Burgess Batteries for radio apparatus and for the operation of timing relays in the astronomical spectrograph.

Thus, in a remote corner of the world, was contrasted "B. C.-type" transportation with twentieth century communication and scientific apparatus. And so, too, is shown the fact that when science travels into unknown places, it puts its faith in proved equipment like Burgess portable power.

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More information on electrical conductors than you could find in a book full of tables.

**Type D, $.50**

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**Type E, $.50**

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**Type F, $.50**

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linger in the minds of those who were fortunate to attend at least this one great function. The long tables, beautifully decorated in a form of a "T" with lighting effects, were a sight never before seen at a ham convention. No one even started to eat until the last person was seated. As the delightful food was being served, to the astonishment of the gathering the lights grew dim and the stage curtain slowly drew apart, and, to the guests' amazement, soft, dreamy dance music filled the hall to the tune of a 12-piece orchestra, which continued during the whole dinner. Then a regular stage show was presented to the enjoyment of all under the direction of a well-known radio Master of Ceremonies, popular from coast to coast. Prizes! Prizes! Prizes! There was almost one for everyone present; in fact, it took almost three hours to dispense them.

This convention will go down in history as the greatest, most enjoyable and colossal amateur convention ever to be held in the world. There was not five cents' worth of damage, and the conduct of all present was marvelous. It was a different, new-type convention. Everyone seemed to be pleased and happy at all times, with all the beautiful surroundings and environment, and with everything starting on time all were interested. The usual noise and disheartening conditions which prevail at so many conventions were absent. It was truly an everlasting tribute to the Oakland Radio Club, Inc., and a monument for the American amateur.

—*W6TI*

## Strays

In typical ham style VK2GP, taking the family and a portable out for a picnic, arrived on the scene only to discover that while there were plenty of spares for the set (including a soldering iron) most of the important edibles had been left at home!

—···—

W9TE says the next time you find a small piece of sand-paper is needed when the stores are all closed, raid the kitchen and swipe the OW's match box. The strip of sanded surface will do quite well in a pinch.

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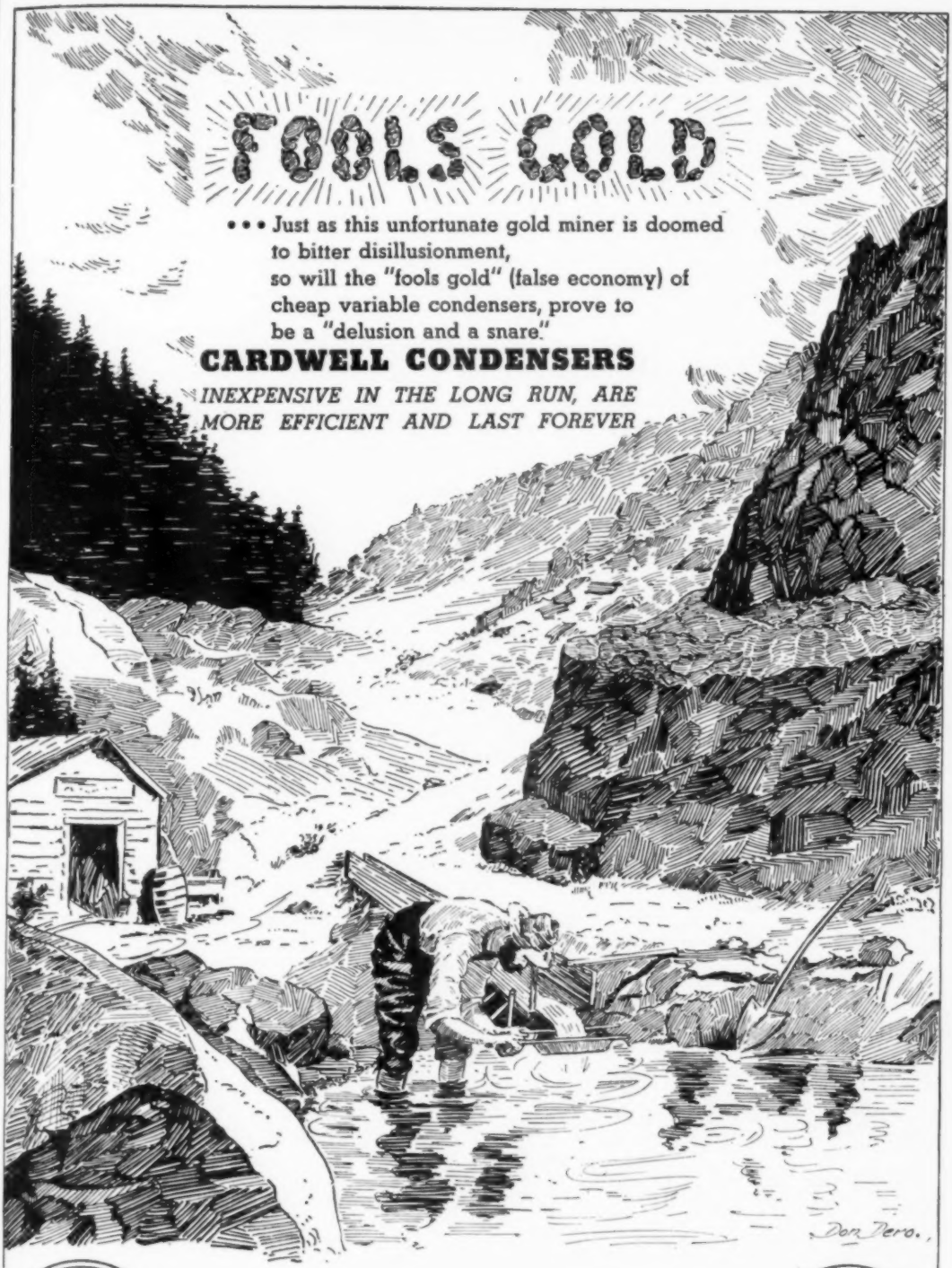
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*it means more complete data are to be found on the indicated pages of the Handbook Catalog Section.*

## Roanoke Division Convention

THE Roanoke Division Convention sponsored by the Mountaineer Amateur Radio Association, held in Clarksburg, W. Va., August 28th and 29th, was a great success.

There was a prize for everyone attending and some left over. Some hams were lucky enough to win two prizes. The prizes included four communications-type receivers, plenty of transmitting tubes, condensers, microphones and other radio equipment.

The program started off at 9:30, Friday morning, with registration. At 1:30 the welcoming address was given by J. Philip Clifford, Prosecuting Attorney of Harrison County. At 2:00 p.m. there was a talk on antennas by Robert Eubank, W3WS, Chief Engineer of radio station WRVA, Richmond, Va. At 3:00 p.m. the entire crowd went to the site of the new 1000-watt WMMN transmitter at Monongah, W. Va., and enjoyed a very fine ox-roast and program. Friday night was spent by attending a dance and floor show at the Waldo Hotel, with free beer to all the hams.

Saturday's program started off at 10:00 a.m. with an A.A.R.S. and U.S.N.R. meeting. At 1:30 a talk was given by Prof. A. N. Friend, W8LIU, of West Virginia University at Morgantown, W. Va., on the "C" layer and its effect on long-distance radio transmission, then came a talk on transmission lines by Frank Key, W3ZA, Assistant Director of A.R.R.L., Roanoke Division. At 4:30 p.m. Prof. H. L. Caveness, W4DW, Director of A.R.R.L. Roanoke Division, spoke on League affairs.

The banquet started at 6:30 p.m. with Prof. H. L. Caveness as toastmaster. There were also a few short talks given during the banquet by the SCM's of Virginia, West Virginia and South Carolina. The banquet ended with the prize drawings, which was what everyone was waiting for.

The ladies had an entirely separate program except for the ox-roast, banquet and prizes. They enjoyed a Bingo Party with prizes, a shopping tour, a theatre party, and of course the dance.

Those not attending sure missed a fine convention, but here's hoping we will all meet at the A.R.R.L. Roanoke Division Convention to be held at Richmond, Va., next year.

— *W8JRL*

## The Southeastern Division Convention

THE Southeastern Division Convention opened at the Suwannee Hotel, Saturday morning, Sept. 5th, with a welcome talk by Mayor John S. Smith. Delegate A. A. Hebert from Bradenton replied in the name of the A.R.R.L. President Carson of the St. Pete Amateur Radio Club then introduced Ben Adams, our director, who gave us a talk on the problems of the A.R.R.L. Board and some ideas advanced by the League at the F.C.C. Hearings, where the amateur presentation was a model of completeness. After the presentation of a resolution to Mr. Adams in

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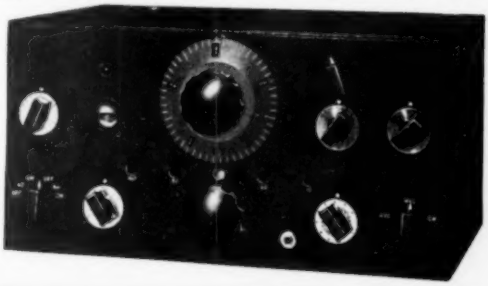

Five band spread ranges . . . 1.7 to 2.0 megacycles, 3.5 to 4.0 megacycles, 7.0 to 7.3 megacycles, 14.0 to 14.4 megacycles, 28.0 to 30.0 megacycles. Automatic Plug-in coils, Permanent Calibration, Micrometer Dial. Amplified, Delayed A.V.C. Power output 10 Watts. C. W. Oscillator. Crystal Filter. Built-in Power Supply. 12 Tubes — 10" Speaker. Complete with speaker. **$125.00.** On Time Payments Listed Below.

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| | Cash Price | Down Payment | 6 Months Payments | 9 Months Payments | 12 Months Payments |
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| **NATIONAL NC-101X** complete. | $125.00 | $25.00 | $17.74 | $11.93 | $9.02 |
| **NATIONAL NC-100** complete with tubes and speaker. | $118.10 | $23.10 | $16.90 | $11.37 | $8.59 |
| **NATIONAL NCX-100** complete with tubes, crystal and speaker to match. | $140.60 | $25.60 | $20.26 | $13.64 | $10.36 |
| **NATIONAL HRO** less power supply and speaker. | $167.70 | $37.70 | $22.78 | $15.35 | $11.69 |
| **NATIONAL HRO** with power supply. | $183.60 | $43.60 | $24.46 | $16.51 | $12.57 |
| **RCA — ACR-175** complete receiver, speaker separate. | $119.50 | $24.50 | $16.90 | $11.37 | $8.59 |
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Full details of any set listed, mailed immediately upon request.

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| 866. . . | $1.65 |
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| 4.4 mfd. | 1500 V. DC | 5 x 3¼ x 1¾ | 1¾ lbs. | 1.75 |
| 5 mfd. | 1500 V. DC | 3¾ x 3¼ x 1⅞ | 1⅞ lbs. | 1.90 |
| 5.2 mfd. | 1500 V. DC | 5 x 3¼ x 2¼ | 2¼ lbs. | 2.00 |
| 10 mfd. | 1500 V. DC | 5 x 3¼ x 3 | 2¾ lbs. | 2.75 |

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regard to the appointment of O.O., the business session came to a close. Following this session a very interesting talk on "Applications of the Cathode Ray Oscillograph to the Amateur Transmitter" was given by C. J. Faulstich, W4CXL, of the RCA Manufacturing Company, Field Engineering Staff.

After a noon recess, a talk that proved especially interesting to those living near the tropical waters was given by Wayne Mason of the Engineering Dept. of the University of Florida, the title being "Radio as an Aid to Storm Detection." He told of problems of instantaneous checking between the Florida institution and the Puerto Rico station and gave some information on the communications equipment in use. This led to a talk on antennas in which many attending asked questions.

In the evening a banquet was served in the ballroom of the hotel, made more colorful by the attendance of thirty-one members of the Naval Communication Reserve of the 7th Naval district, here for their inspection. Phil McMasters, outgoing SCM of East Florida, served as toastmaster, introducing Mr. Hebert, Mr. Adams, incoming SCM Bill Shelton, and the officers of the Naval Reserve. Music and entertainment were by one of the popular teams heard over WSUN. At the conclusion of the banquet the Reserve inspection was held. Those not taking part attended the dance at the Coliseum. At midnight an initiation was held in the Royal Order of the Wouff Hong.

At eight o'clock Sunday morning, meetings of the various nets were held. We must confess that the meetings were poorly attended. At 10 a.m. the party moved to the U. S. Coast Guard Air Base and station NOF where the new-type dial remote-control transmitters were demonstrated, those interested were allowed to inspect the coaxial-cable-fed spike antennas and were shown the emergency power plant, as well as the large rescue planes in which radio equipment was being installed. Afternoon recess the party met in front of the hotel for a tour of inspection of WSUN-WFLA. Leaving the station at Bayview, the party progressed to Clearwater where they were the guests of Donald Roebling. Later, the crowd left for the Jungle Beach Club where prizes were drawn, supper was served and contests conducted. W4CWR was voted the most hen-pecked ham in the division when Ben Adams awarded his wife the prize in the rolling-pin throwing contest. After a beach dance those that were able left for home.

*—W4BCZ*

## Vanalta Division Convention

THE largest gathering of radio amateurs ever assembled in Western Canada, the A.R.R.L. Vanalta Division Convention, was held in Vancouver, B. C., August 28th, 29th and 30th.

Commencing with an informal gathering in the Georgia Hotel, convention headquarters, Friday

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# Fill the Holes in Your QST Files

The December, 1936, issue of *QST* marked its twenty-first anniversary. It especially reminded us of the increasing value of back copies. You will note from the list below that copies covering the first ten-year period (1915–1924) are no longer available. Vol. 1, No. 1 in particular, and other pre-war copies in general, are so rare that they command high prices when available. Copies issued since the war (beginning with the June, 1919, number) up to the beginning of 1925 are becoming increasingly rare — as soon will be many of the copies from 1925 on. In fact, as the list shows, many since 1925 are already out of print.

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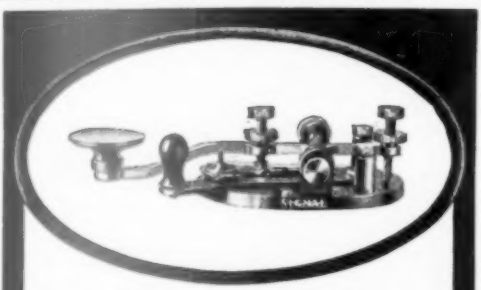

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evening, when over fifty delegates registered, the convention was an assured success. Mr. and Mrs. Reinartz dropped in. Byron Goodman, W1JPE, Assistant Secretary, A.R.R.L., and numerous other delegates from Alberta, interior B. C., Washington, Oregon, and California gathered. An interesting ragchew and general get-together wound up the first evening.

Saturday morning saw a large crowd in the hotel ballroom for an informal ragchew and registration. At 1:30 p.m. the introduction of the distinguished guests and visitors took place, amongst those introduced being Byron Goodman, W1JPE; John L. Reinartz, W1QP; Don C. Wallace, W6AM; Wm. Miller, W7AAN; Asst. Director Northwestern Division and E. J. Amarantes, W6FBW, S.C.M., San Jose, Calif. The communications meeting opened with D. Vaughn-Smith, S.C.M., in charge. Mr. Smith placed emphasis on the handling of traffic through reliable O.R.S. and O.P.S. stations. Mr. Goodman gave an interesting talk on the Amateur Emergency Corps and told the gang of some of the happenings during the floods last spring. Adjourning in the early afternoon a large number of the delegates drove out to Lulu Island to visit the Canadian Government Automatic Radio Station, VAI.

The evening session opened with a banquet at 7:30 p.m., with Ted Corley, VE5BC, as toastmaster. Toasts to the King, the President of the U.S.A., the A.R.R.L., the technical writers and the manufacturers, were followed with short talks by representative members of the various radio clubs from surrounding districts. George Peckham, W7ABD, thrilled the gang with vocal selections between speeches. An impressive moment was the period of silence called in respect to our late President, Vice-President, and Col. Foster. Two hundred delegates stood in absolute quiet with bowed heads.

Although unable to be present at the convention, Dr. Hocking, VE5FG, was the recipient of the B.C.A.R.A. annual trophy cup, given for meritorious service to humanity. A 20-meter Bliley crystal was also given as a permanent keepsake.

Following the banquet a dance was held which proved beyond doubt that the radio amateur is not lacking in the social arts. The prize drawings which lasted until the wee small hours made a perfect finish to the second day for many of the gang.

Sunday morning found a good crowd on the Court House steps for a photograph, following which came the technical meeting. Don C. Wallace spoke on directional antennas and telephone patch panels. John L. Reinartz, W1QP, held the interest of the gang with a lecture and demonstration of his new oscillator and doubler circuits for all bands. Byron Goodman spoke on late developments of single side-band transmission. The meeting adjourned at noon to allow everyone ample time to have lunch and catch the steamer for Bowen Island which sailed at 2 p.m.

After a very interesting cruise through Van-

# A MINIATURE OSCILLOSCOPE AT A NEW LOW PRICE

The new Type CRM Oscilloscope employs the little RCA-913 tube having a one-inch screen. In spite of its small size, this new equipment is thoroughly practical and is quite satisfactory for routine measurements in the amateur station.

The circuit is essentially the same as in the larger CRO, and includes a power supply with controls for brilliancy and focus, a potentiometer for controlling the amplitude of the horizontal deflection, and a built-in 60-cycle sweep. This latter is particularly convenient as it permits checking transmitter operation with no connection other than a pick-up coil.

Although the larger Type CRO Oscilloscope will remain the preferred equipment for the amateur station, the little CRM gives excellent results where size and cost are important considerations.

**NET PRICE $11.10**

*Without Tubes*

**SPECIFICATIONS**

**Tubes:** RCA-913 with 1" screen and 6X5 rectifier.

**Size:** 4⅛" x 6⅛" x 8", not including knobs and binding posts.

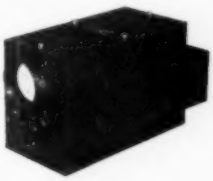
**Controls:** Focus, brilliancy and sweep amplitude.

**Sweep:** 60 cycle sweep built-in, with provision for external sweep of any type.

**Net Price:** Type CRM, $17.45 with tubes, $11.10 without tubes.

**At Right:**

The Type CRO Oscilloscope with 3" screen. Net Price $17.70, without tubes.



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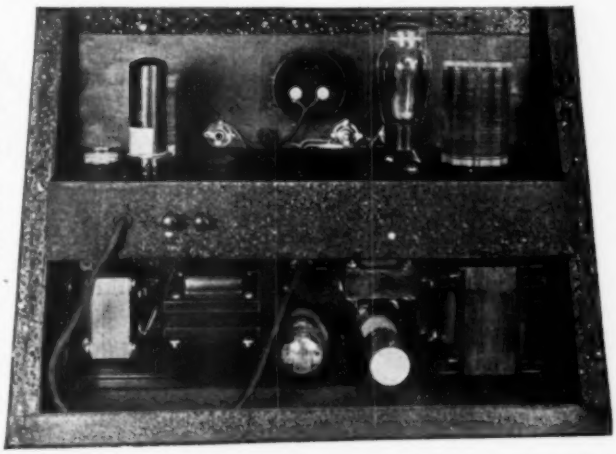
**The Ideal Transmitter for the Beginner or Newcomer in Amateur Radio**

THIS compact CW Rig having 40 watts output can be built complete with tubes for less than $40.00. This makes it an ideal Rig for the Amateur who is looking for a unit that is efficient, inexpensive, easy to build, and easy to operate. In its construction, nothing except Standard parts, obtainable from your parts dealer, are used.

This efficient Rig is designed so that a buffer stage may easily be added, thereby making it a suitable RF section for a phone Rig.

The circuit utilizes the new 6L6 tube as a straight oscillator and a Taylor 825 as a straight Amplifier.

Send for complete information today. Mail the coupon for full details.



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STANCOR TRANSFORMERS

**THIS COUPON *BRINGS***

**Circuit Diagram**
**Operating Instructions**
**Technical Data**
**Templates for Panels**

**STANDARD TRANSFORMER CORP.**
**854 Blackhawk Street, Chicago, Ill.**

Please send me complete information and templates for the STANCOR 40 Watt CW Rig for which I enclose 25c.

Name.....

Address.....

City.....State.....

# WE OFFER—

Specialized personal service of genuine value that is not available from other jobbers.

Time sales of all receivers and transmitters with terms arranged to suit you and 6% interest charge. We finance our own paper.

Complete stock of all amateur apparatus at net prices. Export orders given individual attention too.

## TRADE IN YOUR RECEIVER

All receivers shipped on ten day trial. You need send but $5.00 with order, balance C.O.D. These receivers in stock:

| | |
|---|---|
| RME-69s complete | $134.90 |
| DB-20 signal intensifiers | 39.95 |
| The new 1937 Breting 14s | 99.00 |
| RCA ACR-175s | 119.50 |
| The new 1937 Super Pro when ready | 238.14 |
| Hallicrafters Sky Buddys | 29.50 |
| Hallicrafters Sky Chiefs | 44.50 |
| Hallicrafters 1937 Super Skyriders S-11 | 89.50 |
| Hallicrafters Ultra Skyriders S-10 | 99.50 |

## TRADE IN YOUR TRANSMITTER

All Collins, Harvey, RCA, RME, All Star transmitters at net prices. Sold on terms to suit you with two years to pay and 6% interest charges.

## HENRY RADIO SHOP

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## *with the same Antenna*

The Ward Leonard Radio Frequency Relay automatically changes over the antenna for receiving or sending. It is another item designed and built for the convenience of the amateur radio enthusiast. The entire group of Ward Leonard radio specialties are described in Bulletin 507B. Send for a copy today.

Ward Leonard Radio Frequency Relay is also convenient for switching directional antennas.

## WARD LEONARD RADIO SPECIALTIES

WARD LEONARD ELECTRIC COMPANY
South St., Mount Vernon, N. Y.
Please send FREE Bulletin 507B.

Name .....

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City and State .....

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couver's beautiful inland sea, through Burrard inlet and Howe sound, 159 of the gang arrived at 3:30 p.m. for an afternoon of ball games, tug-of-wars, swimming and prize distribution. The VE's took the honors from the W's in the ball game but the visitors regained their standing in the tug-of-war. The cruise in the moonlight was fully enjoyed by all, the skipper of the steamer even entering into the spirit of the occasion by blowing "CQ" on the whistle as the ship pulled out of dock. Community singing nearly blew the sides out of the steamer as she pulled into the galaxy of neon and electric lights which flood Vancouver's harbor. Arriving in Vancouver at 10:30 p.m., a general disbursement took place with all in attendance voting the convention a big success and looking forward to another in the very near future.

*—VE5DD*

## BOOK REVIEW

*Old Wires and New Waves*, by Alvin F. Harlow. 548 pages, including index and bibliography, 71 illustrations. Published by D. Appleton-Century Co., New York City. Price, $5.00.

As naive and credulous a piece of reporting as one may expect to see in the field of supposedly authentic historical research has come to us in the form of a book entitled, "Old Wires and New Waves," by Alvin F. Harlow, who "in his boyhood may actually have seen the famous James brothers," also author of "Old Towpaths," "Old Post Bags," "Old Waybills," and "Old Bowery Days."

The volume is jacket-blurbed as the "fascinating story of communication from the first signal drums . . . to the present-day miracles of television and scrambled radio telephony." It begins with the connubial delinquencies of Queen Clytemnestra, unfaithful spouse of King Agamemnon in the days of Troy, and ends with a description of the New York city telephone office. Between is a voluminous recital of all the names and most of the events in the development of signalling by flares and semaphores, and of the telegraph and telephone and their numerous complex relatives. Two chapters and part of a third deal with the history of "wireless." It is with these that we are concerned.

There will be many of those intimately associated with radio who will find fault with these chapters. They constitute a conglomeration of errors, omissions and commercial propaganda. The author obviously contented himself in the main by substituting for research the handouts of communications company publicity men, the perusal of commercial house organs, and the acceptance in full without discrimination, segregation or evaluation of the traditional distortion of radio history written as commercial representatives would like to have seen it made. The lack of technical knowledge of radio is painfully evident. It makes itself known in such inconsistencies as an inability to differentiate between "inductive" telegraphy and "wireless" telegraphy, in the spawning days of the art.

The treatment of amateur radio is, to us, as may be expected, particularly unsatisfactory. The early amateur is characterized as an "even worse" element in the "state of virtual anarchy" that is said to have existed. A number of old incidents of propaganda, most of them since disproved and discredited, or at the most unproved, are rehashed; the cruel hoax and amateur radio are made synonymous. Despite defensive warring prior to 1912 " . . . the amateurs lost. Again, as in the case of movie censorship and Prohibition, unbridled liberty had become license and slain itself." The examples seem to us most apt! Concluding the treatment of amateur history, one learns that the amateurs who volunteered and became wireless operators during the world war spread the news of the value of the short waves. "Today, waves as low as five meters in length are being used!"

# The New 1937 Edition of the RADIO AMATEUR'S HANDBOOK

FOR FOUR MONTHS OUR TECHNICAL AND EDITORIAL GROUPS WORKED ON THE REVISION AND ELABORATION OF THE RADIO AMATEUR'S HANDBOOK FOR ITS 1937 EDITION. MANY IMPORTANT TECHNICAL DEVELOPMENTS DURING THE PAST YEAR AND SWEEPING CHANGES IN OPERATING TECHNIQUE AND METHODS CALLED FOR ENLARGEMENT OF THE BOOK AND REWRITING OF ALMOST ALL CHAPTERS. SOME IDEA OF THE EXTENT OF THE REVISION MAY BE HAD FROM THE FACT THAT TWO HUNDRED NEW ILLUSTRATIONS ARE INCLUDED, MOST OF THEM BEING PREPARED ESPECIALLY FOR THIS NEW EDITION. ● SPECIAL ATTENTION HAS BEEN GIVEN TO THE NEW DEVELOPMENTS IN NOISE SILENCERS FOR SHORT-WAVE RECEIVERS AND TO THE NEW TECHNICAL TRENDS IN CIRCUIT DESIGN. A WEALTH OF NEW MATERIAL IS ADDED TO WIDE FIELDS OF TRANSMITTER PLANNING, CONSTRUCTION AND ADJUSTMENT. THE CAPABILITIES OF THE NEW TUBES ARE EXPLOITED TO THE FULL IN THE TRANSMITTER DESIGNS PRESENTED. EXTENDED SPACE IS ALSO GIVEN TO THE EVER-IMPORTANT SUBJECT OF ANTENNAS, THE NEW IDEAS IN COUPLING METHODS BEING TREATED IN PARTICULAR DETAIL. THE ULTRA-HIGH FREQUENCIES COME IN FOR A BIG SHARE OF THE SPACE ALSO, NEW AND ADVANCED EQUIPMENT BEING DETAILED TO ILLUSTRATE THE NEWER TRENDS IN THIS RAPIDLY-GROWING FIELD. ● AS IN PREVIOUS EDITIONS FULL ATTENTION HAS BEEN GIVEN TO CHARTS AND TABLES OF GENERAL INFORMATION FOR THE RADIO ENTHUSIAST; THE VACUUM TUBE TABLES, FOR EXAMPLE, OCCUPYING SEVENTEEN PAGES AND BEING, WITHOUT DOUBT, THE MOST COMPLETE AND DETAILED TUBE LIST EVER PUBLISHED. ● THE BASIC PURPOSE OF THE HANDBOOK IS TO PRESENT A COMPLETE TREATMENT OF EVERY PHASE OF MODERN AMATEUR RADIO FROM ELEMENTARY THEORY THROUGH ADVANCED PRACTICAL APPLICATION, WITH EMPHASIS ALWAYS ON IDEAS AND METHODS THAT HAVE SHOWN THEIR WORTH IN THE FIELD. THIS NEW EDITION, WE FIRMLY BELIEVE, WILL FULFILL THIS PURPOSE MORE EFFECTIVELY THAN ANY OF ITS PREDECESSORS.

**$1 postpaid in Continental U.S.A.—$1.25 postpaid elsewhere**

**Buckram Bound $2.50**

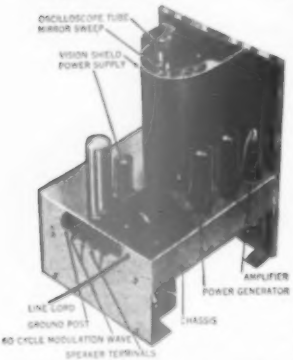
**American Radio Relay League ▪ West Hartford, Conn.**

**NEOBEAM OSCILLOSCOPE FOUNDATION KIT**

KIT— Ready to build **$24.50**

COMPLETELY assembled ready to operate **$40.00**

"Makes Sound Visible"




Easily constructed kit — ideal for experimenters and radio amateurs. *Makes sound visible.* Checks modulation, locates distortion. Excellent for amplifier, microphone and speaker response. Something new in audio measurement. FOUNDATION KIT includes cabinet, etched chrome front panel, chassis, visor shield, front and rear terminal strips, special power and output transformers, vari-speed scanning motor, mirror and special neobeam tube. Makes a deluxe job and high grade instrument for only $24.50. Order today or write.

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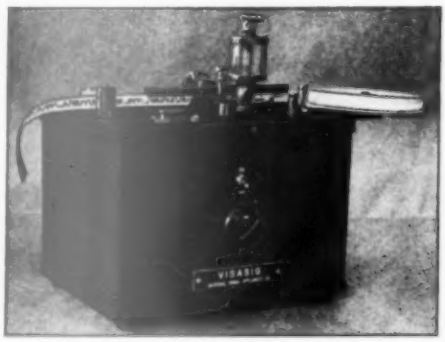


**VISASIG** Full Automatic Siphon Tape Recorder

for Amateur and Commercial use

Will record code signals from the air up to and in excess of 100 WPM. Use it to make a record of your own fist or the fellow's you work. Make a permanent record from your receiver of weather reports, press news, speed contests, etc. See how it helps improve your fist!

VISASIG — with electrically driven tape puller complete in one unit.....$49.00

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*Commercial Station Managers and Executives write for particulars of professional 200 WPM model*

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*Visasig Blueprints $1.00*


Later on the once-despised amateurs—"whose morals have improved in the past quarter century"—are given further treatment as heroes, are accoladed "the world's champion Boy Scouts." Several instances of amateur emergency accomplishment—taken from Earl Jerome's excellent "Minute Men of Radio" in *Reader's Digest*, an authoritative article written with word-by-word assistance by A.R.R.L.—conclude the chapter on heroes.

So much for the relatively insignificant treatment of amateur radio. Let there be no misunderstanding: We have no intention of dismissing the book as valueless. As a historical reference work on the development of radio its value is negative. But it is interesting, well-written, absorbing entertainment. To read it with a background of factual knowledge of the subject on which to base qualifications is an enjoyable experience. For instance: "[In 1912] . . . amateurs and even some professionals rose up in furious protest all over the land. The old rugged individualism had its back to the wall again. Hearings were held by a Congressional committee; and when the Navy told of the impossibility of getting necessary business done because of amateur interference, certain of the amateur witnesses retorted by reading transcripts of conversation which they had picked out of the air, between naval officers or sometimes between officers and women—cheap gossip, intrigue, assignations, amatory trivia, stuff which caused more red faces in the Navy than it had known in many a day—not to mention reprimands and discipline."

Hi!

—*C. B. D.*

## An Optical Pyrometer for Measuring Tube Plate Dissipation

*(Continued from page 44)*

to make glue hold. One hundred divisions take up about 9 inches on the scale. A turn of No. 28 wire looped around the slider sides and pushed down to touch the scale will serve as a convenient

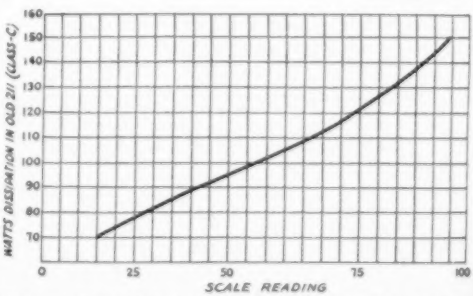


*FIG. 2—TYPICAL CALIBRATION CURVE OF PYROMETER SCALE READINGS PLOTTED AGAINST PLATE DISSIPATION WATTS*

***(This curve will not fit your apparatus, and you'll have to run your own.)***

pointer for indications. Note that two rheostats are used, one 30 ohms and one about 2 ohms. These values were determined experimentally; or, rather, it should be said that they were on hand and worked, so they were used. Some preliminary work with a bulb and milliammeter showed that the range of current we should expect was from 130 to 150 milliamperes. It was necessary to provide some means, therefore, of adjusting the current roughly and then using a vernier scale for readings. Resistance wire from several old rheostats was tried in turn and some selected which gave the desired current change along approximately 8 inches of length.

Calibration of the device is made as follows; assuming its use on an r.f. amplifier:

**(Continued on page 102)**

# SELECTIVITY, DX, Without The Noise—

*LOOK at These Features:*

- Coil Switching
- All-Wave Band Spread
- Built-in Power Supply
- Jensen Dynamic Speaker
- R.C.A. Tubes
- Fully Calibrated Dial
- Phone Jack
- Break-in Switch
- R.F. Gain Control
- Regeneration
- Antenna Trimmer
- Large Knobs

**Sargent Model 11 Tuned R.F. Receiver**

## The Most Vital Question of All— HOW SELECTIVE IS IT?

In the crowded condition of the amateur bands the prime consideration in any successful receiver is SELECTIVITY. A receiver that cannot cut through the powerful locals, eliminate the R.A.C. notes and tune in DX on adjacent channels will not satisfy the requirements of the modern amateur operator. Model 11 meets these demands satisfactorily. For the C.W. man we can promise selectivity comparable with that of multi-tube receivers without crystal — a standard of performance exceptional in a tuned r.f. receiver. Combined with this selectivity will be found the extreme sensitivity and low noise level characteristic of the regenerative tuned r.f. circuit — a combination radio operators have sought for years. On C.W. the WEAK SIGNAL response — meaning DX — is, we believe, greater than on receivers of other types. The noise level, in the receiver itself, is practically non-existent. On phone and broadcast Model 11's performance is only a shade less surprising, and it is extremely good on these also. An all-around radio operator's receiver.

**Announcing Sargent Crystal Set for Marine Work**

Not only complies with the new regulations on shipboard but is a rugged, reliable set designed for the purpose. Tunes 550 to 1400 meters. Selective and sensitive — of real value when the tube receiver is out of commission.

**Model 11 Net Prices for 110 V. 60 cycles operation**

| | |
|---|---|
| Model 11-UA, UNIVERSAL tuning range, 9.5 to 20,000 meters | $75.00 |
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| Model 11-AA, AMATEUR tuning range, 9.5 to 550 meters | $46.00 |

Prices include power supply, speaker and R. C. A. tubes

Model 11 is available in all A.C., D.C. and battery voltages

IMMEDIATE DELIVERY — Write for full description

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# OK2AK

**GAMMATRONS WIN ON BOTH SIDES OF THE WATER!**

**Hans Plisch, OK2AK, winner of W VE...DX contest for Czechoslovakia with 46,560 points.**

*A new 20-page brochure is now available containing data for the latest Type 154 Gammatron as well as a revision of the Type 354 Gammatron literature. Request the new Catalog 5357.*

HEINTZ AND KAUFMAN LTD. SOUTH SAN FRANCISCO CALIFORNIA U. S. A.

## Operating News

(*Continued from page 62*)

December in addition to the regular A.R.R.L. quarterly O.P.S. publication coming this month which will have dope on the January 23/24 doings in detail. Every operator of a good 'phone station should qualify as O.P.S. and get this dope. If not lined up write your S.C.M. for the information and the address of your nearest Phone Activities Manager.

—•••—

## Official Relay Station Doings

THE results in the October O.R.S. Party, the first in the all-season O.R.S. competition, speak for themselves in the following tabulation! Two competition months have now gone by. The first traffic totals to count a possible 50% toward the W4NC-Trophy appear in this issue, and the B.P.L. shows who is standing highest in this department of the contest. In the Party W3EOP came out on top—191 worked in 51 Sections and the only scores to top 50,000. W9IU was right up neck and neck, working 190 ORS, 6 OPS and 57 Sections for 46,552 points and only the adjustment for "central-eastern" ease of working sections and stations on a 5:4 basis put him second. W4NC, W8JTT, W1BFT, W7BSU, W6KFC etc. were next in the *high ten*—but read the list yourself. It gives the power, stations, sections, and score. Next O.R.S. Party is scheduled for January 23rd–24th . . . don't miss it.

| *Station* | *QSOs* | *Sections* | *Heard* | *Score* | *Power* | *Section* |
|---|---|---|---|---|---|---|
| W3EOP | 191 | 51 | 65 + 10 | 50167 | 400 | E. Pa. |
| W9IU | 190 + 6 | 57 | 65 + 16 | 46552 | ... | Ind. |
| W4NC | 159 | 51 | 69 + 15 | 41919 | 300 | N. C. |
| W8JTT | 147 | 49 | 75 | 37413 | 50 | W. N. Y. |
| W1BFT | 166 + 3 | 38 | 54 + 1 | 35302 | 500 | N. H. |
| W7BSU | 101 + 1 | 47 | 35 | 34815 | 800 | Mont. |
| W6KFC | 102 | 47 | 72 | 34805 | 50 | Ariz. |
| W8KWA | 162 | 49 | 61 + 2 | 33042 | 150/650 | W. Pa. |
| W3NF | 149 + 2 | 37 | 80 + 15 | 33004 | ... | E. Pa. |
| W1UE | 144 | 40 | 71 | 32640 | 50 | Conn. |

| *Call* | *QSOs* | *Power* | *Score* | *Call* | *QSOs* | *Power* | *Score* |
|---|---|---|---|---|---|---|---|
| W8KNB | 144 | 35 | 28868 | VE2DR | 120 + 1 | 150 | 22671 |
| W1EZ | 139 + 1 | 90 | 28314 | W4BOU | 110 + 3 | 100 | 22594 |
| W1GME | 125 | 70 | 27846 | W1INF | 105 | 250 | 22068 |
| W3FTK | 135 | 90 | 27749 | W3ADE | 104 | 100 | 21420 |
| W1TS | 112 | 50/250 | 27559 | W8AQ | 121 + 2 | ... | 21344 |
| W5DEJ | 127 + 1 | 125 | 27468 | W2AHC | 107 | 300/580 | 19754 |
| W8BYM | 136 | 150 | 27000 | W6LMD | 66 | 70 | 19722 |
| W2HZY | 127 + 2 | 60 | 26893 | W2IBT | 108 | 50 | 19520 |
| W8OFO | 144 | 400 | 25890 | W2DXO | 113 + 4 | 300 | 18844 |
| W8IUY | 131 | 75 | 25863 | W7DUE | 69 | 250 | 18537 |
| W9BAZ | 110 + 5 | 1000 | 24570 | W7CRH | 60 | 30 | 18165 |
| W8KUN | 129 | 100 | 24531 | W8QAN | 98 + 2 | 300 | 17442 |
| W9ENH | 106 + 2 | 150 | 22968 | W2HYC | 105 | 200/240 | 16680 |

—•••—

### The Haywire Net

W9PVZ, A.R.R.L. Colorado R.M., reports on the Haywire Net (self-styled by the net members). This net is composed of the following stations operating every night at 6:00 P.M. PST on 3795 kcs.: W6JVG, San Francisco, Trunk Line "B"; W6ETJ, Boulder City, Nev., T.L. "B"; W6GQC, Salt Lake City, T.L. "B," Asst. Director, NCR, A.A.R.S.; W6LMD, Sonoma, Calif., T.L. "F," A.A.R.S.; W6KDI, Cedar City, Utah, A.A.R.S.; W7DUE, Portland, Ore., T.L. "G," R.M., A.A.R.S.; W9PVZ, Denver, Colo., T.L. "B," R.M., NCR, A.A.R.S.; W7EBQ, Alternate for W7DUE. This net, through connections with A.R.R.L. trunk lines and other well-established traffic routes, is able and willing to clear traffic to all parts of the U. S. and to Hawaii, Guam and the Philippines. Any station having traffic to clear is invited to break in on the net at any time, or contact any individual station at any other time.

## Field Day Scores

(*Continued from page 30*)

| | | | |
|---|---|---|---|
| W1CGY-1 | W1CGY | 19-B | 38 RT |
| W3GAD-3 | W3GAD | 8-A | 24 RT |
| W9BTJ-9 | W9BTJ | 11-B | 22 RT |
| W9ESM-9 | W9ESM | 4-A | 12 RT |
| W1HDQ-1 | W1HDQ | 1-A | 9 |
| W9WFV-9 | W9WFV | 1-A | 9 |
| W2HRT-2 | W2HRT | 2-A | 6 RT |
| W6AM-7 | W7RT | 2-C | 2 |

## N.C.R. Invites Amateurs

Lt.-Comdr. B. C. Purrington, U.S.N., District Communication Officer of the Third Naval District, writes that at a recent meeting of amateurs someone mentioned that coercive tactics were being used in obtaining members for the N.C.R. in Western New York. It is possible that this report is based on some misinterpretation of a recruiting effort that may have been over-enthusiastic. At any rate, the D.C.O. asks us to call the attention of all hams to the fact that threatening or coercive action is *not* authorized in asking amateurs to join the N.C.R.

All amateurs, however, are invited to join, if they wish, as the N.C.R. is of direct benefit and interest to radio men in the following several respects: (1) Identification with the United States Naval Service. (2) The opportunity to so prepare one's self as to receive the best possible assignment in case of a national emergency. (3) Temporary training duty of two weeks yearly with pay at a Naval Radio shore station or aviation base, or a two weeks' cruise if and when funds permit. (4) The opportunity to learn Navy Radio Procedure and communication methods. (5) Interesting weekly drills by radio. (6) Advancement in rating when properly qualified. (7) The opportunity through liaison with the American Red Cross as well as the Navy and Naval Reserve communication systems to perform valuable service in time of a local emergency. (8) New friendships and new contacts with men interested in the communication field.

Further information on the N.C.R., and the address of the individuals to see about N.C.R. in any of the several Naval Districts, will be forwarded in response to inquiries sent A.R.R.L. by letter or radiogram.

—•••—

### N. N. J. QSO Party Results

W2CAY won first prize, a type 354 Gammatron tube, in the annual QSO Party of the Northern New Jersey Section held on May 8th, 9th and 10th. All amateur bands were used, 3.5-Mc. c.w. being the most popular with 1.75 and 56-cM. 'phone following in order; 64 stations turned in reports—and a good time was enjoyed by all. W2CAY made contacts with 104 stations in 41 different towns, rolling up a score of 23,288. W2GUM was a very close second, working 97 stations in 46 different towns, and winning an Astatic crystal microphone with his 22,448 points. Thirty prizes were awarded in all and went to the following: W2CAY 23,288, GUM 22,448, GFW 18,312, HEB 15,300, ENZ 14,630, IAT 14,616, GON 14,025, GFF 13,755, IMB 13,532, GQX 12,614, HNP 11,484, GGE 10,956, CW 10,725, GGW 10,626, BZJ 10,590, HZC 10,400, JFC 10,150, CFW 9193, GBY 8903, FBZ 8848, HHC 8752, GMF 8644, HEG 8525, IAP 8235, IBR 8176, HTX 7668, FOP 7160, IUV 7068, HVM 7020, ECO 6786.

# STATION ACTIVITIES

## CANADA

### MARITIME DIVISION

MARITIME—SCM, A. M. Crowell, VE1DQ—VE1GL, R.M., hits a nice total this month, making the ole '46 take 75 watts and like it. HH is now R.M. for P.E.I. and main contact for Island traffic. EC says QRM from hums, harmonics and headaches. EV claims rig going fine—pair 801's final. HJ has 100 watts to an 800. BZ is back on 3845 kc. HX has rebuilt the rig and has been doing some work on new superhet. EY still schedules W1AJ. EX has just been thru a rebuilding spasm. JB is quite active on 3.5 Mc. CO is working big DX on 28 Mc.—reports via FR and HH. AP is QRL chasing QRM. AF is going to spend the winter in Florida. BD has been QRL service work. AC got the new 6L6 on the air. BE is QRL making ginger ale. CW has QSO'd all districts on 7 Mc. with 6L6, and 250 volts. JG gets out FB on 3.5 Mc. FR is using a pair of 31's in final—was visited by ER when in port on RCMP cutter. GS is ready to bust the ether after a long QRX. JU is coming on strong. KH (VO1C) is now on from Halifax QTH using 2A5 crystal osc.—pair 2A5's buffer and pair tens in final. AW is changing QTH and going to have an FB ham location this winter for big DX. ET threatens to go in this years' DX contest in a big way as soon as he returns from comm'l job; he is

rebuilding to steel rack and panel. The Halifax Amateur Radio Club is going ahead with plans for a swell new club house. Quite a number of new members were contacted through registering at the Club's booth at the recent Provincial exhibition. The New Brunswick gang is asked to look for GU and EV who will be glad to help you "Report via Radio." HH, Charlottetown; EC, Dartmouth; GL, Halifax are all on the air between the 13th and 16th of each month to help swell this report. Come on, gang, let's go.

Traffic: **VE1**GL 174 HH 92 EC 87 GU 54 EV 42 HJ 2 XE 1.

## VANALTA DIVISION

ALBERTA—SCM, Alfred D. Kettenbach, VE4LX — JK has moved to Vancouver and will be on with new VE5 call soon. EO got FB report from Africa. HM is active on four bands, and knocking over the Europeans on 'phone. CY and SW are going strong on their nightly QSO's. PM, GS and TM are working lots of DX. KZ worked his African. AX is busy building 28-Mc. rigs for airplanes. FC's work is taking him away from home. The Calgary Club had a very enthusiastic meeting, there being forty-five present. A very instructive and entertaining series of meetings are being planned for this winter by the executive. GD is working with 28-Mc. rigs. LA is getting FB results with his 28-Mc. rig. JJ is going strong on 14 Mc. BW is heard nightly on 3.9-Mc. 'phone. EO is giving the gang fine service as Official Broadcasting Station!

Traffic: **VE4**LX 59 GE 38 WX 27 QK 10 AF 9 AAZ 4 EO 3.

BRITISH COLUMBIA—SCM, D. R. Vaughan-Smith, VE5EP—VE5CC now merrily knocks off DX. AE often runs into Victoria. CH is good at getting out of town jobs; he is going strong on 3.9 Mc. QC is another ham afloat. DY has fun with peanut tube! EC finds RK-23 FB on 28 Mc. GB got himself a Ball-and-Chain Oct. 28th. Ask HP about his 150T's! DV sees lots of 7DGY. HR made W.A.C. at last. FB, Ron. OQ has tens coming up! IC has potent plans for ½ kw. BO is fond of 7 Mc. OK is Victoria's top traffic man. FW is new President of Victoria Club. KN had bad dose of pneumonia but is now on the road to recovery. VE5EC, Victoria, reports he has many unclaimed QSL's. Shoot him a self-addressed stamped envelope and get those missing DX cards. Victoria Short Wave Club's new executive: VE5FW, VE5JC, VE5DY, VE5EC and VE5IC. The B.C.A.R.A. re-elected their last years' officers!

Traffic: **VE5**CC 12 AE 4 HP 21 DV 4 OQ 7 IC 4 BO 7 OK 20 EP 54.

## ONTARIO DIVISION

ONTARIO—SCM, Fred H. B. Saxon, VE3SG—R.M.'s: 3GG, 3GT, 3MB, 3TM, 3WX, 3SG. P.A.M.: 3NX. This being my first report, fellows, I hope you will bear with me. I must, first of all, thank the numerous hams who sponsored my nomination for this job. My one big wish is that you will all give me the same support that you gave Jon Perdue and Sam Trainer before him. Thanks, gang. NO is on from new QTH. KT, ZE and OI are all considering O.R.S. The Queen City Club gang wants to know where yours truly reads his *QST*. Well, it is this way . . . every minute counts now. HV has his O.R.S. and is doing good work. CG is rebuilding and will be looking for schedules and O.R.S. appointment. ABW is looking for good Western Ontario outlet for T.L. "I" traffic destined for Central States. DU and WK have resurrected their old schedule. EI, Strathroy, visited SX and FK, Toronto, and while at FK helped install one of Jim Lamb's noise silencers. PV is back again after a lay-off of a year. WK has nucleus of splendid net going now, made up of DU, London, HV, Smooth Rock Falls, MA, Ottawa, QB, Lanark. WK ties in with VE2BU, Montreal. More section coverage is desired and any ham interested can get further info' from WK or SG. ZE is playing around with 6L6's and has got to stage where he talks to himself. TM is rebuilding with higher power, RK23 and RK28; he also has new QTH. The Queen City Club, Toronto, is sponsoring the VE/W contest next April. MJ gave very interesting talk and demonstration before Wireless Association on 56- and 28-Mc. The Cardinal Club had talk on P.A. systems by Mr. Tanner of Northern Electric.

Traffic: **VE3**MB 78 WK 60 UO 54 SG 17 DU 12 ZE 8 KT 6 PL 5 DJ-AID 4 GT 2 **VE9**AL 20.

## QUEBEC DIVISION

QUEBEC—SCM, Stan Comach, VE2EE—Winter weather brings much increased activity on the air. The SS Contest started with a good attendance in this Division, a few dropped out but many were in at the finish. Reports to date list DR as the top man in Quebec with over 33,000 points. Fine work, Bill. Appointees to the A-1 Operator Club now include BB, LC, BU, EE for C.W. and DX for 'phone. LQ arrived in Montreal for a short visit. FU is now located in Labrador. BE, EE and IO were guests at a meeting of the Club Canadien Francais de la T.S.F. New O.R.S.: IN and KM; the former has finished his new rig with a pair of 35 T's. Our Trunk Line is broken out West but our R.M. clears traffic through the National Trunk stations W8KWA, W9PDE or W9ILH all on 3670 kc. It would be appreciated if locals would keep this channel clear after 11 P.M. HH is using a 6L6 oscillator. HL is on 3.5-Mc. 'phone. AX is as usual hearing plenty of DX; Gordy has worked two XU stations. BG has been keeping a schedule with HK1GK in Baranquilla, Colombia. DA is a regular on 3.5-Mc. 'phone. DD is back in Grand Mere building a new rig. IY has also bought a Sky-Buddy. DU has completely recovered from his recent operation. DX has new QTH. GX has been heard on 28-Mc. 'phone. JY has purchased the latest Sky-Rider receiver. EX was using a water-cooled tube in the SS Contest. HM is using the latest in crystal mikes. CR has rebuilt his modulator and has a very FB signal on 14 Mc. JJ has an ACR-175. News is scarce this month. Your S.C.M. is not clairvoyant. I can only print what I hear about. Kindly do your bit and send in news items. See all, hear all and tell the S.C.M. everything.

Traffic: **VE2**AB 44 BU 51 DR 350 DG 374 HT 81 EC 39 JK 7 EE 20 LC 35 HH 50.

## PRAIRIE DIVISION

MANITOBA—SCM, A. J. R. Simpson, VE4BG—Full resumption of winter activity has taken place, most notable being the nice traffic totals for this period. AG tops the list. VG keeps consistently on with his schedules. More stations of this type are needed. GC, an old-timer on the traffic end of things, will be handling the Trunk Line with AG helping. BB was a visitor to Winnipeg a short time ago and is now back North operating. CD was also a visitor and has returned to his operating post. DU keeps after the DX with new antennas. EK is heard consistently on 14-Mc. 'phone. ER finds the 6L6's a problem. FS finds a pair of RK20's FB. GL has up a new antenna. IP is all set for a busy season. The LH brothers keep the 14-Mc. 'phone busy. LL has the new antenna up and is heard on 14-Mc. 'phone with FB quality, MW is making several changes in the rig, MY is acquiring an XYL. NI finds plenty of DX on 28 and 14 Mc. and is busy Class B modulating the transmitter, NM keeps on 14 Mc. NT is heard on 28-Mc. 'phone. OK finds 56 Mc. a busy band. QA has a strong 14-Mc. 'phone signal. QC has difficulties making an RK23 perk on 14 Mc. Nov. 2nd at 4:00 P.M. a small Indian boy fell on a hot stove burning one eye and was instantly blinded. There is no doctor on the reserve and AEB put his station on 7 Mc., about seven watts power. In immediate answer to his QRR. ZC at Moose Jaw came back. AEB gave the dope to ZC, who wired to Portage La Prairie. The Indian Agent at Portage La Prairie phoned a doctor at Ste. Rose du Lac, nearby to Reedy Creek P.O. The doctor was able to reach the injured Indian boy in time to save the sight of the other eye. FB work, AEB and ZC. Also on Oct. 17th in answer to AEB's CQ, FN was able to relay AEB's request for a nurse which resulted in saving the life of a baby. AEB sends his belated thanks to FN. AEB has also handled QSP's for Winnipeg fliers.

Traffic: **VE4**AG 114 GC 87 VG 16.

SASKATCHEWAN—SCM, Wilfred Skaife, VE4EL—There's an old saying that a person gets just what he pays for, and this applies also to this Section report. If you fellows do not send in the news, I cannot put it in this report. So wake up and let me have the news. XM put up a new Zepp antenna. IM is a new ham at Yorkton. HC was transferred back to Manitoba. FM is building new Osc.-Amp. rig. DI made his twelfth consecutive QSO weekly with Van. on 14-Mc. 'phone. BD worked a ZL on 28-Mc. 'phone. It has been suggested that this section have a local traffic net on a spot frequency, c.c. How about it, boys? Those interested write in.

Traffic: **VE4**UL-DI 28 EL 7.

## CENTRAL DIVISION

ILLINOIS—SCM, John Huntoon, W9KJY—R.M.'s: 9ILH, 9RMN. PNV is working the YV, OA, etc., stations on 14-Mc. 'phone. NUF is interested in building a multivibrator unit. NQI had a tough time getting rid of one message. KMN sports a new S.S. super. MIN is buying an HRO. W.A.C. again on 28 Mc. for BPU, making total of 76 countries! ANQ bought new car so radio will have to suffer for a while. DBO, resigned from A.A.R.S., is now over in Tonica second operator for NIU. A 1.75-mc. 'phone "Old Buzzards" Club has been formed, meeting every morning at 2:00 A.M.; members must be capable of telling one good clean joke every morning. See President ONR if interested. AA is going further into O.O. work by building frequency meter. SKF is on T.L. "L". FGT completely rebuilt, from 53 osc. to '03A final. A noise eliminator built by HQH enables him to hear plenty of extra DX. TAY divides his time between radio and hunting. Congrats to HUX, proud papa of a brand new YL operator. NHF is trying to get bugs out of transmitter. SU1KG was first African QSO for SCH. MLF tried every 14 Mc. antenna in the "bible" without much success. SKR copied Navy Day message. KHD at Dartmouth College is lining up the hams there for a big club station. JO still has about ten thousand DX cards awaiting envelopes—have you sent yours in yet? KA at new location managed to W.A.C. with only 40 watts. ACU likes 28 Mc. better than any other band. INY is working both 'phone and c.w. on 14 Mc. AIM is another proud papa—also a YL—congrats. YQH is one of the most consistent 56-Mc. stations in Chicago area, says SUW. JVJ is now working for RME Company at Peoria. WR is doing okay at new location. AAR is traffic manager for the Armour Tech Club station, YW, and plans big things for this season. RWS is awaiting his Skyrider. COW likes 28-Mc. 'phone as relief from crowded 14-Mc. band. NMZ blew the big transformer. PLL had the misfortune of cutting his hand (yes, the right one), so we lose temporarily a good traffic man because he can't send "lefty." SS claimed interest of EBX, DDO, VEE and TZV, among many others. JGS pledged Eta Kappa Nu, honorary EE fraternity. VBT is awaiting new HRO for club station UIH to go with the kw. rig. RTY has been presented with a YL by his XYL, RBP; date Nov. 15th, name Barbara June. RBP holds a second class commercial ticket. RTY is D.N.C.S., 1st Dist., Ill. A.A.R.S.

Traffic: **W9**RMN 622 ILH 505 KJY 202 EBX 208 CGV 81 DDO 38 SG 31 ANR 30 TZV 29 VNW 22 VEE 21 PNV 15 NQI 9 NUF-KMN-RVF 5 IVD 8 BPU-FTX-ANQ 4 NIU 2 ONR-AA-SKF-FGT-DBO 1.

INDIANA—SCM, Arthur L. Braun, W9TE—EGQ is pining away for a new antenna. SQH has 211 final on 1.75-mc. 'phone. IU is building diamond ant. for K5AG schedule. TBM is QRL with A.A.R.S. schedules. SYJ is having trouble with his antennas for DX. VIO is giving 1.75-mc. 'phone a try. HSF is working DX with his new vertical "Q" ant. TTA is putting in P.P. RK20's. TQU works K6 on 3.9-Mc. 'phone. QG has been assigned WLHL. TRN is trying 28 Mc. with a 6L6 tri-tet. ABB is also WLHM. AXH is lining up O.P.S. on 3.9 Mc. HUV says 28 Mc. is "hot." HPQ is building 6L6 for his exciter unit. VTG is giving code practice on 1820 kc. every night. WQD is getting out fine on 1.75 Mc. LLV says new QTH is fine for DX. IHD is building new receiver and going on 14 Mc. JHQ likes A.A.R.S. schedules. GFS had fine time in QSO party. YHB, new at Westville, is DXing on 7 Mc. UNI is trying for W.A.S. on 3.5 Mc. WOC is getting off to fine start with traffic, etc. TE has improved ant. system. FHM is on for regular schedules. DET is instructing group of Boy Scouts in code work. SLPZ bt9 wants Ohio schedules. EPT is proud papa of a new boy. NOW is the time for all GOOD men to come to the aid of the S.C.M. Reports are needed to keep this column interesting so send in your report *every* month. New amateurs interested in joining up with A.A.R.S. write to 9HUO. Any amateur who is interested in Naval Reserve can write to S.C.M. 9TE for information. We regret the passing of NTP, one of our outstanding O.P.S. The gang will miss him.

Traffic: **W9**EGQ 5 IU 8 TBM 56 SYJ 22 HSF 8 QG 96 ABB 56 (WLHM 36) HUV 2 HPQ 5 LLV-IHD 2 JHQ 12 TE 16 FHM 7 (CA9C 33) TYF 2 EPT 6. **W8**LPZ bt9 10.

KENTUCKY—SCM, G. W. Mossbarger, W9AUH—Traffic totals look encouraging from this month's showing. Thanks, OM's. CDA hands in the month's high and does some fine operating. The state network is rapidly filling up with good stations and particular attention is asked in getting all hands to use this net to move state traffic. Your attention is called to the short period competition announced in the Blue Grass Ether Clippings. It is: for the station turning in the greatest number of bona-fide messages during the time Oct. 15th—Jan. 1st, number to exceed 250 to be eligible, I will award a new type 830 tube. To the operator in the state, regardless of club or league affiliation who sends in to me the most interesting report on activities in the state I will award a crystal ground to your exact frequency anywhere in the 3.5-Mc. band. YHK is now leading on the report contest, with CDA headed toward the tube award. BAZ, HBQ, EDQ and HAX so far seem to have good chances with KOX and THS acting as dark horses. THS is welcomed to the KYN and HOW! These chaps down at Knox are going to make all youse guys get up and go. CIC is working 7 and 14 Mc. HOV is again hitting it up. SDC wants schedule with home town. MWR reports IFM, KKG, MGT and YHU active and CRJ and LH working on rigs. FZV wants 'nother state QSO party. HAX says Santa is going to bring him new rig. RBV postals from Indiana U. HBQ wants state news. SFD again states the skywire is going up. RBN collapsed during SS. EDQ is a hard worker, puts up new masts weekly. BAZ goes to Headquarters to report. KOX is becoming real operator as he joins A.A.R.S. ELL, AUH, BGA and MN argue among selves relative to SS. YHD is on 1.75 Mc. with TXC and HDZ. SZK, HBQ, HDZ and SXP all get together on 1.75 Mc., but sh - - - it's a secret. AEN thanks all and sundry for requests for dope on his famous 6L6 single control all band, one dial, desk control electron coupled osc., and triple shielded fold back buffer. ERH DX'es from Frankfort. WMH is going in for power. WMI has new receiver and a green ticket from the R.I. RBQ has 242's in final. YQO puts another 99 in final. YRW threatens to get going. YHK's husband says "by gosh!" and a few other things and goes up for 'nother crack at the R.I. Luck, OM! Well, gang, there 'tis. If your name ain't in bright lights it's your fault. 73.

Traffic: **W9**BGA 1 AUH 127 ELL 29 KOX 40 BAZ 95 EDQ 77 RBN 6 HBQ 86 MN 9 HAX 105 CDA 131 FZV 1 MWR 16 SDC 5 HOV 28 IXN 26.

MICHIGAN—SCM, Harold C. Bird, W8DPE—R.F.D. 2, Pontiac, Mich. W9PDE, Joe Lessard, Ass't S.C.M., Box 223, Munising, Mich. MICHIGAN EIGHTS: LHH finally got his W.A.S. and is now going for W.A.C. and traffic. NXT had great time in SS contest; to start off, his mast broke as he was about to begin contest. FX is busy with new transmitter and new car. DED wants to sell his rig and build new one. Write him for particulars. DSQ has been having tough time, first transmitter failed then he got sick. Hope OK now. KNP-RR is very busy trying to get stations for state net. BMZ says A.A.R.S. is coming fine. GQZ has increased power. FTW is very busy with A.A.R.S. net and Mich. net, also new job. KSY has moved and no place to put ant. NDL is new O.R.S. at Flint. IFE says frequency congestion around Waltham Avenue very bad, suggests using flashlights. ARR sends nice report and schedules. ICM has new super. NIV says new job is keeping him busy. JKO expects to visit sunny Calif. soon. NQ's mast blew down. MV got his crystals mixed and got pink ticket. NGC is having trouble getting new rig to come down on 3656 state net freq. LTT is taking over LSF schedules on alt. weeks on trunk "A." BRS is still working on the new rig. SH reports from Lansing, says seven ops. there, wants schedules. LSF is so busy with job has to pass up nets on alternate weeks. QGD is putting up new mast. COQ, new reporter, handled traffic on N.C.R. nets. NQI keeps nice schedules on Mich. net and N.C.R. PXY wants O.R.S. Ye S.C.M. went hunting rabbits but just got sore muscles. SILENT KEYS: It is with deep regret that we report the passing of two of the Michigang, one very old timer and one comparatively newcomer, W8IA and W8ITO. Both were taken suddenly during the last month. MICHIGAN NINES: PCU reports leaving the Island in week or two and discontinuing activities for winter. CWR says Ironwood gang is planning to attend hamfest at Duluth. CE reports new station, YU in U.P. PDE is still plugging away on T.L. "M" and Nat'l Net. FB, Joe. 8GUC reports priority message handled from WLM relayed to destination at 5:40 P.M., answer back to WLM at 7:20 P.M. 8OCT reports that 8NJI of Detroit worked 9TYF of South Bend, Ind. with no antenna on the rig. 8NJI was R6 solid with a '45 final and exactly 2 watts input. The time was 3 P.M. on 7 Mc. Happy New Year to all.—73—Hal.

Traffic: **W8**LHH 14 NXT 11 FX 28 DED 11 DSQ 1 KNP/RR 85 BMZ 122 FTW 133 IFE 16 ARR 38 NIV 10 JKO 50 NGC 97 LTT 19 BRS 24 LSF 70 NCB 33 COQ 5 ELD 12 NQI 39 DPE 98 PXY 29 DYH 19 GUC 125. W9CE 19 PDE 54 PCU 8 CWR 13.

OHIO—SCM, Everett H. Gibbs, W8AQ—Congrats to Chuck, HMH, on being the first OHIO station to make the B.P.L. this season. He keeps daily schedules as far as Denver on 3.5 Mc.! ISK reports total of over 300 and says, "No news"; another case where no news is good news, it seems. IAW reports by radio; his FB total was made in 10 days, then he had to run away on a trip. MQO is another of the old reliables to help keep the Section on the traffic map. HCS is changing QTH again; hope Bill stays put this time. NYY relays from Toledo to Northern Quebec regularly on 1.8-Mc. 'phone. RN returns home from operating on the lakes and seems to be taking a postman's holiday. EEQ is "one of the Wentz's" and schedules two of the others, EBG and NLZ, besides a few outsiders. WE just moved, but works out OK on temporary antenna and old rig. UW contemplates moving to Lima and builds low power portable 6L6 rig to insure staying on the air. AQ is now on 3539 kc. most evenings. KIM misses old Regular net, but it won't be long now, Glen. Ditto from Dave of LCY and Art of GSO. LZE does consistent work on 3.5 Mc. BYM found time to report, though QRL breaking in a new HRO. The General at NAL reports traffic every month, but no news. How come? MXW of Van Wert (the town UW made famous) has applied for A.A.R.S. and O.R.S. appointments. KNF favors multiplying O.P.S. party scores by number of bands used. HFR schedules a round table every A.M. on 3.9-Mc. 'phone. INT says QRL. AXQ adds another crystal, 1957 kc. KLP took a turn at aircraft radio, but is now in a machine shop. APC succumbed to the lure of the T-55. OUR has moved to Price, Utah, and took his rig along. GL, OM. LRV doubted the T9X reports, so finally installed crystal to make sure. GMI took a little trip, and reports from Tampico, Mexico, but will be back soon. DXB added a T-200 to his collection this month, but was heard in England S8-9 on old rig. LUT has been trying to decide whether to build new rig or build a new room in basement. BKE is back from vacation. BMK sold SW3 and is rebuilding with proceeds. MDQ is new reporter; he is on 3.9-Mc. 'phone. PNJ has P.P. '46's on 1.8 Mc. CDR suggests that some shut-in ham undertake an agency to notify hams when their licenses are about to expire, for a small fee. Any volunteers and customers? ORM is enjoyably surprised at his first SS contest. AEL has left Ohio to join engineering staff of W.E. at Chgo. QHP is new reporter from Salem, with 25 watts to a '45. FGC has cleaned up the shack and is QRV. JTI is still in the process of rebuilding, but had small rig on for O.P.S. party. EMV now divides time between 3.9 and 14 Mc. ARF, O.P.S. applicant, is a 56-Mc. enthusiast, besides being active on 1.6, 3.9 and 14 Mc. KOK has been operating on lakes all summer, but had no luck with 56-Mc. rig aboard. EDR sends dope on his FB push-to-talk system, which is almost human. LGM took trip to Flint for reunion and is rebuilding to 6L6-865-825's. PYB is on 7 Mc. and PVZ on 1.8 Mc. in Barberton. NHV moved to new location and gets out, but in wrong directions. Several appointments have been cancelled for inactivity and applications for O.R.S., O.P.S. and O.O. are welcome to build up the Section.

Traffic: **W8**HMH 849 ISK 321 IAW 276 MQO 161 HCS 84 NYY 43 RN 41 CMI 39 (WLHH 38) WE 38 UW 35 (WLHI 48) AQ 28 KIM 26 LCY 25 LZE-BYM 21 NAL 18 MXW 13 KNF 10 INT 7 OUR 7 HFR 6 AXQ 5 KLP 2 BBH 61 (WLHA 40) CIO 38 (WLHC 43) FFK 21.

WISCONSIN—SCM, E. A. Cary, W9ATO—How about marking reporting dates on the calendar, boys? SES has been assigned the call WLTF in the A.A.R.S. JAW blew a filter condenser and rectifiers but is going again now. HSK bought an RK20, a 1000-volt pack and an 18-watt amplifier. AKT's work took him to Portage for a few days. SZL is QRL state net and N.C.R. RQM had lots of fun in SS. ULE's rig broke down completely. VNB reports via radio. ATO is QRL Christmas rush. ONI says sigs kinda weak up there. YKH is on 7 Mc. with 150T. PRA has pair of '52's on 3.9 and 14-Mc. 'phone. GWZ bought a home and rebuilt rig. HTN got married. UGQ is taking 6L6 portable deer hunting. ULB is rebuilding 6L6 and '10 rig. RLB is grinding crystals for state net freq. PHT reports that Racine club has practically disbanded. OZQ, PFT, SGD, SGR and UPD are going to U. of W. KZZ broke his arm. PHT has new s.s. Skyrider receiver. IZM has commercial 'phone ticket and is working in local BC station. PFH also works there. IZL is working out on 28-Mc. 'phone. KZU is building new rig. KYJ is having trouble with his. TFS blew '66's. HMS and FJJ are running FJJ's rig in Madison for contact with home. UJN got class A ticket. WSY built new rig. UPM has moved. SPE is now high power man on 7 Mc. in Milwaukee. RSR enjoys school at U. of W. PSC and TPO are on 1.75-Mc. 'phone and RZY gets there once in awhile. UIR is from Missouri and can't believe the snow gets as high as a house; this is his first winter; he is control operator at WEBC in Superior. WYT, new ham in Superior, had his first QSO with ONI. PQY is trying schedule with ASQ on 7 mc. DXI has his antenna up now! HSW, UGE, RJH and VDY joined A.A.R.S. ONI says they haven't found the man who voted for Landon yet. HBH is still working for Westinghouse in east. JLG is still with Bell Lab. LNM has 6A6, 802 and T55 in new rig; puts 250 watts on 14 Mc. with it. ROU plans new 6L6, 6L6 and T55 rig. IHB and EEQ recently took class A exam. EEQ also put up a 252 foot zepp for 1.75-Mc. 'phone. AVM now lives in the country and has swell location. FZC of Antigo is attending U. CJU was recently granted license for WSAU, new 100-watt high fidelity station at Wausau. RNX is still QRL 14-Mc. 'phone. TDN and IYL are QRL school. ESM has been off the air due to an operation for appendicitis. WGP–WUEN has R.C.A.-ACT 40 'phone and c.w. rig. RYE is planning on 1.75-Mc. 'phone. CLUBS: Madison club met on Nov. 9th for first meeting of the year. The officers elected were AVM, Pres.; AKT, Secy-Treas.; RNX, IHB and DCU Directors. 20 persons were present, 15 of which were licensed hams. They will edit their club paper again this year, AKT being the editor.

Traffic: **W9**SES 222 JAW 170 HSK 101 (WLTD 17) AKT 88 SZL 87 (NCR 23) RQM 72 ULE 53 VNB 34 ATO 26 ONI 16.

## WEST GULF DIVISION

NORTHERN TEXAS—SCM, Richard M. Cobb W5BII—EES leads the O.R.S. gang this month. DXA is active as Route Manager and in charge of traffic lines within this section. The bulletin "North Texas Amateur" published by him is being well received by the gang. FAJ is new O.R.S. and is working in Trunk Line "D". EOE reports the Panhandle Radio Club met Nov. 11 with 32 present. EOG is on 28-Mc. 'phone. CHJ is active in the A.A.R.S. Sun. and Mon.; he wants to get in touch with any stations interested in A.A.R.S. FZQ is doing a bit of rebuilding; he has a total of 14 states worked now. FBQ has applied for W.A.C. DNE is back in the hospital but hopes to be back with us soon. BCW has rejoined the A.A.R.S. and is getting some schedules into shape. EPC is on almost every night and Sun. afternoons. EOU has new rig with 200 watts input. FRA is blowing the granules on 28 Mc. EYG is a silent key now. GCO reports for the first time; his first QSO was with 5CFW. EAU reports for the Belton gang; he is now on 1.75 Mc. 'phone. DCH is also trying to get 1.75-Mc. 'phone job on the air. FWA is going to use '46's in final stage. FZJ, ex-2HCP, is now in Dallas and his appointments as O.R.S. and O.B.S. are being transferred to this section. BII is moving equipment to new quarters and will be fired up again before long.

Traffic: **W5**EES 463 DXA 376 FAJ 136 EOE 129 CHJ 4 FZQ 1.

OKLAHOMA—SCM, Carter L. Simpson, W5CEZ—CEZ is running 10 daily schedules in addition to A.A.R.S. and N.C.R. Drills. EXC moved his rig down to his radio service shop. EGP has been appointed A.D.N.C.S. for Okla., 2nd Dist. A.A.R.S. FRC is really getting into the traffic game. CVA drove up to Ponca City and spent a week-end with the S.C.M. DWB has trouble waking up for his WX schedules. EZV is getting lined up in the A.A.R.S. FFK has ordered a new Breting 14 and anxiously awaits its arrival. FOJ has moved to new QTH. FSK has joined the A.A.R.S. and is really going places. DZU moved his rig over to CUX's shack to work in SS contest. FEC reports for first time; he is attending O.U. at Norman. AMT is back in the 8th C.A. WX net again. BLJ is on the air for A.A.R.S. Drills. ADC enlisted in the N.C.R. FLY is trying to get a National Guard Station on the air. EMD is Oklahoma's chief "cipher buster" in the A.A.R.S. FBI is unit control station for N.C.R. in Ponca City. ESH breaks into traffic reporters column for first time. BNF changed QTH to Henderson, Tex. EHQ is located on the Okla. A. & M. campus at Stillwater and is operated by FFZ. FIK reports traffic for first time; he has added a '10 to his 59 crystal and is getting nice results. DRD took up active status in A.A.R.S. FFH works A.A.R.S. schedules cross-band. BLT finally got a new rig back on the air and reported into A.A.R.S. FQN applied for O.P.S. FKL has installed a Taylor 756 in final and reports it FB; he also reports a ham at Ft. Sill having contacted 6CNT on 28 Mc. using an Army field set ACR-194

(*Continued on page 104*)

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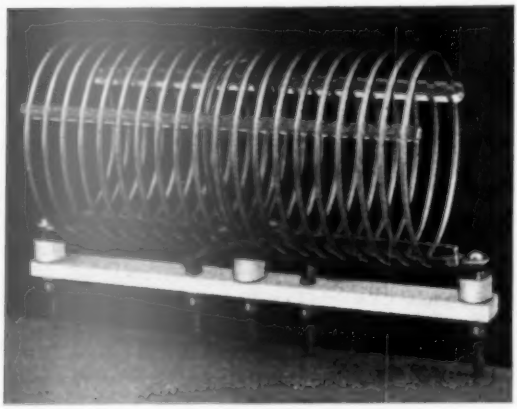

Coto

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Now available with internal LINK COILS and STEATITE terminal bars. Made for Antenna, Tank and Buffer circuits and for all bands with uniform mounting centers for each type.

STEATITE MOUNTING BASES

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*Available at all leading jobbers or write for descriptive bulletin*

RADIO Coto PRODUCTS

COTO-COIL CO., Inc., PROV., R.I.


## An Optical Pyrometer for Measuring Tube Plate Dissipation

*(Continued from page 96)*

1. The tank coil is shorted out and excitation removed.
2. The bias is reduced slowly until the tube plate barely begins to show color.
3. The bulb in the pyrometer is lighted, with the slider set a few degrees above the zero end of the scale, and the large rheostat adjusted so that the bulb filament is barely brighter than the tube plate.
4. By means of the slider adjustment, the filament of the bulb is brought down in brilliancy until it cannot be seen against the plate. (The indication is very sharp; if the filament is too bright or too dim it will stand out clearly, but will disappear entirely when properly adjusted.)
5. Plate voltage, plate current, and slider scale reading are recorded for this adjustment.
6. The input is increased in steps by reducing the bias and readings taken at each step. (Remember that it is possible to melt plates out of tubes—even 210's.)
7. A graph is made, showing plate dissipation (watts) plotted against slider reading. The plate dissipation is equal to the input, since we have taken measures to keep any power from getting out.

Power (watts) = Plate volts × plate current (amps.)

By referring to the graph it is possible to determine dissipation at any value between the maximum and minimum values plotted.

If it is desired to determine tube efficiency, the following formula is used:

$$\%\ \text{Eff.} = \frac{\text{Input (watts)} - \text{dissipation (watts)}}{\text{Input (watts)}}$$

The power output to the tank coil is Input (W) − dissipation (W).

If the large rheostat is moved, the readings will be shifted one way or the other along the scale. If the batteries weaken materially so that the large rheostat must be decreased in order to light the bulb, new data should be secured and the device recalibrated.

## With the Affiliated Clubs

*(Continued from page 46)*

when he led his band into Utah, club members said figuratively, "This is the place."

Although city officials seemed favorable, it took something else to get the project started. The "something" was one of those happy coincidences that doesn't dare turn up in fiction. The Red Cross-American Legion Disaster Relief Corps was puzzling over the establishment of an emergency communication system in case another earthquake such as that of 1906 should visit the region. Harry Engwicht, W6HC, charter member of the club, was delegated to confer with Corps leaders.

What could be more appropriate than an

*(Continued on page 106)*

# Use Variable CRYSTAL CONTROL

1. Frequency of crystal can be varied over a range of approximately 6 Kc. at the 80-meter fundamental.
2. Variations up to 12 Kc. possible when doubling and 24 Kc. when quadrupling to 20 meters.
3. Crystal has frequency drift not exceeding 4 cycles/Mc./°C. Frequency adjustments do not affect the operating stability.
4. Unit fits 5 prong tube socket and may be mounted in any position. It can be used to replace crystal units now in use.
5. Price, within 5 Kc. of specified minimum frequency, $8.00; to exact integral specified Kc., $10.00. (Furnished only for the 80-meter band.)

*Ask your distributor for your copy of the 1937 Bliley Catalog describing the complete line of Amateur Crystal Units and General Communication Frequency Units from 20 Kc. to 25 Mc.*

# BLILEY CRYSTAL UNITS

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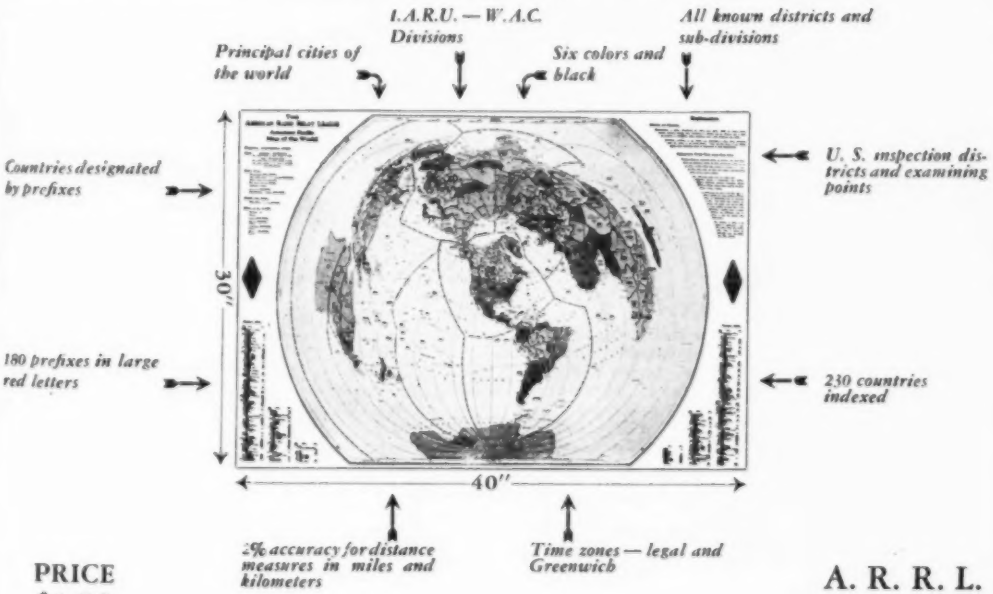
## AMATEUR RADIO *Map of World*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All known districts and sub-divisions
Principal cities of the world
Six colors and black
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30"
180 prefixes in large red letters
230 countries indexed
40"
2% accuracy for distance measures in miles and kilometers
Time zones — legal and Greenwich

PRICE
$1.25
POSTPAID

A. R. R. L.
W. HARTFORD
CONNECTICUT

(Continued from page 101)

with less than 2 watts input. FKI has applied for permission to put up a rig at Ft. Sill. FRP, the 18th F.A. station, is on intermittently at Ft. Sill. FXG signed up with the A.A.R.S. and applied for O.R.S. CEQ made the grade and got his radio telephone First class. CFA has erected a wooden mast for 14-Mc. vertical skywire. KZ received renewal of his O.P.S. appointment. DUI plans to come on with a kw. AIR has designed and built a class B transformer tapped to give 300 different combinations of load impedance and is looking for a new QTH where he will have a kitchen for the XYL and an extra room for the OM.

Traffic: W5CEZ 693 EXZ 293 EGP 249 FRC 163 CVA 131 DWB 123 EZV 92 FFK 81 FOJ 55 FSK 52 DZU 36 FEC 32 AMT 31 BLJ 26 ADC 24 FLY-EMD 17 FBI 14 ESH 12 BNF 11 EHQ 10 BJG 6 FIK-DRD-FFH-BLT 4.

SOUTHERN TEXAS—SCM, Ammon O. Young, W5BDI—OW turns in another nice traffic total. MN uses most of the report card to list his schedules. DWN is off the air due to delay in license renewal created by Army regulations. EWZ has a 59 c.c. on 7160 kcs. with 15 watts input. CPB reports that he worked VK7—also that he worked the SS. FZD was also in the SS. FGX has a 6L6 and T55 with 150 watts on the air at Allen Military Academy and is handling traffic. "It Oscillates" is now one year old. Congratulations on your anniversary. FTM has been working gobs of VK's over FNL's rig. DZR and YF were guests at ERC's place October 17th and 18th. EYR has a new crystal on 7009 kc. GBH can't seem to hold down two jobs and get on the air at the same time. EXE is working 7 Mc. in De Quincy, La. EUO has a brand new junior op. and to make it more interesting for the next generation she's a YL. FNL and FGK are running a race to get their W.A.S. certificates. EWJ is rebuilding with a 6L6 tri-tet osc. FI is almost off the air—he is trying out his new neon tube oscilloscope with the rig on a dummy antenna. The following stations in Houston worked in the SS: ARO, DAW, DMB, EAL, FWB, EEX, EWJ, and yours truly. WG was a visitor at your S.C.M.'s shack between SS week-ends; he made over 35,000 and thinks he lost—that's tough; made 20,000 here and also think I lost.

Traffic: W5OW 1566 MN 812 BEF 21 FGX-CPB 20 DWN 3.

NEW MEXICO—SCM, Joseph M. Eldodt, W5CGJ—DGP leads with traffic this month, as well as several other activities; he maintains sixteen daily schedules and is looking for more; he also leads in holding long QSO's, having recently held one with 6MEW that lasted eight hours straight. DZY is still holding down Trunk Line "D" and doing a good job of it; he makes highlights this month for helping locate a man whose daughter had died. Good work, David. ENI is alternate for DZY on Trunk Line "D". ZM is pretty busy but finds a little time to spend on the air. CGJ finally got his rig to behave and is again on the air, on 14, 7 and 3.5 Mc. 3BYS of Philadelphia spent a few days with your S.C.M., and we had a fine visit; he was able to contact some of his friends over CGJ. We need more items for this section, fellows. A few of the "old steadies" remain silent this month. Makes your S.C.M. feel kind of bad not hearing from a few that have never failed to report. He always likes to hear from old friends, at least. Be sure to send in any items of general interest. Let's step into it and put the Section way up there. DGP will QSL to all stations worked in the SS, if they will but send him their cards.

Traffic: W5DGP 441 DZY 133 ZM 46 (WLJG 97) ENI 43 CGJ 14 (WLJE 4).

## DAKOTA DIVISION

NORTH DAKOTA—SCM, Hartwell B. Burner, W9OEL—TQZ grid modulates '46's on 1.75 Mc. with poor results. DM is No. Dak. station of Trunk Line "A". JZJ reports rig froze on 28 Mc. and reports visit from RII from Velva. KZL visited C.C.C. gang and reports PGO attending R.C.A. in Chicago; his QTH is 745 N. Michigan Ave. NZG of St. Paul, new op. at Fort Lincoln, swings a mean old bug. SWC is on 1.75-Mc. 'phone and has DX bug. Very nice letter from SZA who reports job with State Highway Department located at Pisek, N. D., and spends his spare time at shack of WEK, who will study for his commercial. WLI is new O.R.S. and handles N. Dak. end of T.L. "H". NUM reports from Portland, Ore. that he awaits W7 call and will soon be on again. Dakota Division S.C.M.'s now schedule tri-weekly for inter-section exchange. WYC, new Hope amateur, is son of RQX. I must remind all Communication appointees that if they are not active and reporting by Jan. 1st they will be dropped and be replaced by new material. Thanks to YNX for Grand Forks report. TVP, TQI, WJC, PPG and WFO are going to the U.N.D. WFO and WJC are rebuilding BPM rig. JMW, TSB, RZA and YNX are all on 1.75-Mc. 'phone. KQF has a new Sky Buddy. RZA has been working portable in Grand Forks during the summer. YCJ has 6L6 on 3.5 Mc. NAW has a new Super Pro. RGT is building a 1 kw. rig. TUF is active on 14 and 7 Mc. bands.

Traffic: W9KZL 166 SWC 57 OEL 35 RQX 20 DM 15.

SOUTH DAKOTA—SCM, Andrew J. Kjar, W9SEB—ALO is working on remote control since it's getting too cold in the old shack. WAJ is busy handling traffic on trunk "G". SUO is operating portable in Pioche, Nevada on 3677 kc. and puts a nice signal into So. Dak. Gang, there is a chance to work that elusive state of Nevada. YNW finds a little time to work a few on 3.5 Mc. WSJ is building a new rig. AZR blew oscillator filter in new rig but says she is a keen rig just the same. WZH dropped in on the S.C.M. to get acquainted and says he is going on 1.75-Mc. 'phone soon. VOD is using a pair of 48's in final and can work both coasts most any night. SGI is proud owner of a new Super Skyrider. Don't forget the Dakota Division contest on January 8–10!

Traffic: W9WAJ 346 SEB 144 FOQ 53 VOD 34 YNW 9.

NORTHERN MINNESOTA—SCM, Leonard Hofstad, W9OWU—Please don't forget to send your reports along next month. We have several new appointments this month. PTU is the new R.M. for No. Minn.; he has also received a position on trunk line "A" which operates on 3805 kcs.; your S.C.M. will be his alternate. No. Minn. is sitting pretty for moving traffic now so let's go to town! VTH is a new O.R.S. at Willmar. IGZ is new O.P.S. and O.B.S.; he will transmit the regular A.R.R.L. Official Broadcasts at 2 P.M. on 3960 kcs. on the first three Sundays of each month, and at the same time on 1850 kcs. on the last Sunday of the month. In addition, on the second and last Sunday of the month he will transmit special news of interest to hams in the Min-Dak Radio Club and also any other hams that may hear him, so drop him or your S.C.M. a

### THIRD ANNUAL DAKOTA DIVISION QSO PARTY

THE Third Annual Dakota Division QSO Party will be held from Friday, Jan. 8th, at 6:00 P.M. C.S.T. to Sunday, Jan. 10th, at midnight C.S.T. All amateur stations within the Dakota Division which includes North Dakota, South Dakota, and Minnesota are eligible to compete. There are no restrictions as to power, c.w. or 'phone, or the bands used. The object will be to work as many stations within the Division as possible.

The rules are as follows:

1. All amateur stations within the Division are eligible to compete in the party on any of the amateur bands.

2. The calling procedure will be CQ DAK CQ DAK CQ DAK DE W9 – – –.

3. Score five points for each QSO with a Dakota Division station. Each Dakota Division station heard but not worked will count one point. The total points made in the party is then multiplied by the number of sections worked. There are four sections in the Division so the largest multiplier used will be four.

4. At the conclusion of the contest tabulate your results listing the stations worked and heard and mail to your S.C.M. within ten days.

5. Prizes will be given to the high scorers in each section and a grand prize will be given for the high score in the Division. The Southern Minnesota Radio Assn. donated a cup last year which will go to the winning station. The station winning the cup three successive years will gain permanent possession of it. The grand prize this year may be a T-55.

Let's see a big turnout for this party. This should be a lot of fun and the prizes are well worth while. As a final hint, the 3.5-mc. band should be the best band for the majority of QSO's.

W. F. SOULES, W9DCM, SCM, So. Minn.

card with news, etc., for the broadcasts. After each transmission he will stand by and listen for calls from hams who heard him, so after he stands by please call him by sending his call and then your call alternately. This is so we can determine how many of you hear the broadcasts. YKD is shooing the bugs from his new receiver. CWB has new service shop open. AZJ is on the air again. GBN bought a new receiver and wants to sell his old one and his rig. KQA is using GBN's transmitter and receiver but his antenna is only 8 feet above the ground. PTU keeps the A.A.R.S. going with three daily schedules. FTJ is going to MPLS on Dec. 5th to take class A exam. The secretary of the Laporte Radio Club sends a report for the gang at Laporte. The club meets every Tues. and Thurs. at 3 P.M. Usually the club station WBO is on the air at this time. They are open for schedules. Their frequencies are 1806 and 1900 kcs. and harmonics of these in the 3.5-Mc. band. YMJ is on 3.5 Mc. with a pair of '01A's in par. The Laporte club is making plans for a hamfest to be held soon. WMX is back in school after several months in the C.C.C. VVN and VYP are ops in C.C.C. LSC is contemplating a Super Sky Rider; he has a 500-watt 'phone-c.w. rig on the air. Here is some real news! There is a YL op at ORQ now. Don't get excited because the S.C.M. gets all the 88's. ORQ also put e.c. osc. in the rig. HEO moved into new house, but is back on the air again. The Min-Dak Club had its last meeting of the year at Lidgerwood, N. Dak. on Nov. 1st. Attendance was small because of snow storm but an excellent dinner was served after the meeting. YAP bought a rock for his rig. Your S.C.M. keeps busy as electrician, projectionist and "netter." BFV is on for a few QSO's at noon. MOW had a try at 14-Mc. 'phone; he is building up a heavy duty modulator and will work all bands from 1.75 to 28 Mc. MOV is on 14-Mc. c.w. VVA just got a Johnson Q 7-Mc. antenna and is also putting up a vertical 14-Mc. skywire. WVD is busy teaching. VTH is going down for his class A. A Happy New Year to all.

Traffic: **W9**PTU 478 ORQ 339 RTN 23 SIW 40 FTJ 28 HEO 52 IGZ 7 OGZ 45 OTW-HDP 20 OBE 14 PAN 10 RBA 139 RJF 61 RPM 12 SKT 4 SQA 22 OWU 148.

SOUTHERN MINNESOTA—SCM, Webster F. Soules, W9DCM—BKX should be on the air soon after readjustment from a disastrous fire in his store. FNK is back on 14 Mc. and working DX as usual. TEA is having trouble getting his 59 and RK-23 working. DGE has six FB schedules. GHO plays a banjo in an orchestra. Plans are under way for a bigger and better MID AMERICAN-DAKOTA DIVISION A.R.R.L. CONVENTION to be held May 21st, 22nd, and 23rd. Start thinking of those dates right now. YKC claims that a bootleg 14-Mc. 'phone is using his call. KHY is on 14 Mc. getting lots of DX and traffic. PTY just got on 3.9-Mc. 'phone with 250 watts into a 150P. DEI is building a new Jones exciter unit. NXM is QRL with studies at the U. of Minn. KWL moved his '52's from 14 to 7 Mc. CRW is QRL with KGPB-KGPR and his Collins is loaded with dust. YPT is having a lot of fun on 56 Mc. LIP paid the Minneapolis Radio Club a visit and told them what made Taylor Tubes work. The gang will talk about LIP's party in room 526 for years to come. KUI hopes to get on 3.9-Mc. 'phone soon. TKX is trying to recover from the S.S. BN has held the same schedules consistently for many years. FHH wonders how to change from c.w. to 'phone without expense. WQF is working DX with a 6L6 osc. VFR is building a new rig. VJA works on 56 Mc. BFV, VVA, VTH, MOV and UML from Wilmar made the long trip to attend the Mpls. Radio Club. EFK operates at SJK once in a while. ITQ started out with a lot of parts and ideas for a 56-Mc. receiver but changed his mind. TAT, OWJ and IAK went to work for Collins. PAT will be on 14 Mc. soon. DWG uses a Philco for a receiver. DCM has a new doublet antenna on 3.9-Mc. 'phone. KYM, South Bend, Ind., has been a welcome visitor to Minneapolis. DRO can't find an antenna location. Please note the announcement of the big Dakota Division QSO party to be held Jan. 8th, 9th, and 10th. Valuable prizes have been donated for the winners.

Traffic: **W9**TKX-DCM 13 BN 4.

## MIDWEST DIVISION

KANSAS—SCM, Harry E. Legler, W9PB—Your new S.C.M. appreciates all the congratulations and good wishes that have been received by radiogram and mail. We are now getting into the swing of things and look for a bigger and better Section. The Division Convention at Topeka was highly successful, an all time registration record being hung up. The Kansas Cyclone Net is electing officers and making things hum on the 1.75-Mc. 'phone band. FLG and PB have sickness at home, cutting down their time on the air. IQI runs up a nice traffic total with National and "H" trunk schedules. BYV handles his traffic on 1.75 Mc. OWZ says the Sweepstakes are a lot of sport. The S.C.M. is sizing up the R.M. and P.A.M. eligibles. Who does the gang recommend for consideration?

Traffic: **W9**IQI 351 BYV 24 PB 21.

MISSOURI—SCM, J. Dewey Mills, W9CJR—KCG is copying PX for KFBI; sends regards to Missouri gang. PXH reports QRL school in Amherst, Mass. KIK was in the SS contest. UAB will be on soon with storage battery outfit—power from wind generator. ARH is still DXing. EDK works ZU, SM, FS, etc., on 28 Mc. DHN is DXing. ENF is still QRL work. JAP reports Trunk "H" moving some traffic now. DIC reports via radiogram. LBA contacts about 80% of DX called on 7 Mc. KEI is now on with newly rebuilt rig. TCM applied for A.A.R.S. PYF changed rig to 2A3 Hartley. TGN got Radiotelephone First ticket; received WAC certificate, and says lots of DX on 28 Mc. OUD reports "Still alive by accident"??? SHK is on extended trip south. HUG received S.W.L. card from Russia. JVL moved to W6. PSM is QRL service work. CJR is QRL "Antenna down in the turnip patch."

Traffic: **W9**AIJ 725 SGP 372 (WLUK 6) OUD 335 TGN 258 PYF 149 TCM 96 KEI 74 LBA 60 DIC 57 JAP 36 ENF 7 DHN-EDK 5 ARH 4 KIK 1.

NEBRASKA—SCM, Samuel C. Wallace, W9FAM—BNT is doing some very fine work in organizing the seventh C.A.A.R.S. FAM is back in the harness on Trunk Line "L" and pleased to report this line is operating through from 9LCX to 6AXN in FB shape. POB is the champion A.A.R.S. cipher buster. FB. DI is keeping a bunch of fine schedules, is on Trunk "B" and is trying to line up a State Net. UHT also has a bunch of FB schedules and is still working on his new skywire. RUJ had the misfortune of blowing up his power supply; but is working with lower power. EHW has been on the sick list but is improving now. TBF says the Northeast Radio Club is still growing. KPA says if can sell another insurance policy he may be able to get the rest of the necessary parts for completion of his new FB transmitter. YDZ reports YRF and YRM now on 1.75-Mc. 'phone and took the whole Norfolk gang to help them erect their masts for skywires. VQO is rebuilding. YHN is going to town on 5 watts; 31 states. YNO blew couple filters and is on with 2 watts. YDZ ruined a meter. YRM bought out CIR and is on with 225-watt 'phone. MZF would like to have the Sweepstakes made a semi-annual affair. KJP is working 7 Mc. mostly: he took a run out to pay FAM a visit, and AVX and KVZ brought along another ham from the H.C. Noll Co., Omaha and had a very FB visit all day helping get some of the bugs out of FAM's rig. EWO reports the purchase of a new Sky Buddy.

Traffic: **W9**BNT 1096 (WLU 311) FAM 271 POB 155 DI 78 UHT 47 RUJ 46 EHW 6 TBF 4 BQR 1 SGT 13.

## DELTA DIVISION

MISSISSIPPI—SCM, J. H. Weems, Jr., W5CWQ—EFX is working 7 Mc. and getting FB reports with low power. EYE is building new rig. EGE and EKV visited hams in Jackson. EYE has Radio class at Jackson Central High School. DNS and DXN are in Port Arthur, Texas going to school. FSS is getting lined up with A.A.R.S. EGE and EKV visited FSS in Tylertown. DEJ moved station to dormitory at State College. BXA is new A.A.R.S. State College A.R.C. reorganized with CJB, Pres.; FBY, V. Pres.; CWQ, Secy-Treas. EZA got new HRO. CWQ got QSL from F.C.C. while not on the air!

Traffic: **W5**DEJ 67.

TENNESSEE—SCM, B.G. Lowrey Smith, W4DEP—R.M.'s: 4AYE, 4CXY. Tennessee Net is doing well with FX as N.C.S. BAQ will return to Alabama soon. We hate to lose him. BAF doesn't get out so well, now that he has his new rig going again. CPY's 50T went west. AYE is working with WSIX and trying to meet with the net at the same time but finds it won't work, so Walker is meeting the net when the rig works. DFB is working DX with the new rig; he hopes to get 14-Mc. 'phone soon. This is your new S.C.M.'s first report. How about you fellows sending in your reports? The new address is 673 Hillcrest St., Memphis.

Traffic: **W4**PL 705 AKJ 89 BAQ 90 RO 34 DEP 37.

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## With the Affiliated Clubs

(*Continued from page 102*)

emergency station ever ready to serve the community in hour of need as a memorial to Colonel Foster, a man who had given of himself so generously for the benefit of others?

On August 23rd five members of the club made the 50-mile trip to Carmel, taking a truck and trailer belonging to Lloyd Saxon, W6EEX, and a large Cadillac sedan belonging to Willis Clayton, W6JTE, secretary of the club. Other members of the party were: Al Clark, W6MUC; C. W. Jacklin, W6IXJ, and the writer. At Carmel the party was met by Mr. Heintz, who supervised operations and said the shack was to be stripped completely. A glance about showed the equipment to include a three-kilowatt Kilbourne-Clark ship generator and a five horsepower motor to run it. The transmitter, a variety of receivers and boxes and closets of miscellaneous meters, tubes, crystals, wire and other odds and ends, not to mention a stuffed alligator and a handsome antelope head which friends had sent the colonel from far corners of the earth were all there, as well as the colonel's log books, which are being carefully preserved.

Thanks to the good strong backs of Clark, Saxon and Jacklin the generator and motor were finally loaded into the trailer, with Bill Clayton and the writer offering helpful suggestions and getting in the way at the psychological moments. The transmitter was disconnected and loaded with less difficulty. It comprised of a '47 crystal oscillator, two '10 stages into a pair of '10's, into a pair of '52's feeding a pair of 204A's in the final. These items, together with the miscellaneous parts and apparatus filled the car, truck and trailer to capacity. By mid-afternoon the party headed homeward to San Jose after making the acquaintance of Charles Guth, W6NAL, Carmel traffic officer and a good man to know.

At its regular meeting the following evening the club moved into its new quarters, the generator being "hiked" up five flights of stairs by a larger crew. President Roy Pinkham appointed Clark, chief operator, Jacklin as technician and Harry Engwicht to supervise installation.

The club is now turning its attention to the organization of a five-meter net to serve as a field organization feeding the central station, W6SV. That call, by the way, has long been held by the club. A drill will be held in coöperation with the Disaster Relief Corps when arrangements have been completed. The club is also considering ways of making the station a memorial to Colonel Foster and a museum of early radio developments. The colonel's collection included tubes and equipment long obsolete and rarely seen. San Jose is also rich in relics of radio's formative period due to the experiments of Charles D. Herold and others.

—···—

## Vigilance Committee

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transmitters operating on 56 Mc. and other bands in that area. Two such stations operating on the 56-Mc. band have been located and silenced, the owners being warned to cease operation until they secured the necessary licenses. One of these stations had been operating under the call "W2FYH of Dunellen." The legal owner of W2FYH was an operator at an airport in Pennsylvania! The other station had been operating from a location in Westfield, N. J., and possessed an elaborate and efficient installation, better in fact than outfits owned by many licensed Hams! Both of these stations were located by the monitoring of the band, the coöperation of other amateurs and the use of mobile equipment. Several other illegal stations in the vicinity are under observation and it is hoped will soon be silenced. Direction finding equipment is available for use on the lower frequency bands. Poor quality signals, harmonics, B.C.L. and interference from 'phone stations on the various bands also come under the work of this committee. Receivers fitted with field-strength meters and portable carrier-shift indicators and linear monitors are available for observation and correction of these cases.

## The 913 Oscilloscope

(*Continued from page 24*)

It may be necessary, as mentioned before, to reduce the a.f. voltage by means of a potentiometer in order to get the pattern on the screen. The r.f. input can be adjusted by varying the coupling

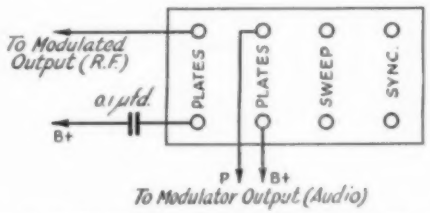


*FIG. 7—TERMINAL CONNECTIONS FOR TRAPEZOIDAL MODULATION PATTERN WITH SINUSOIDAL SIGNAL SWEEP*

between the r.f. plates (vertical) and the transmitter output.

### GENERAL POINTERS

Whenever there is present a d.c. voltage which tends to move the pattern from center, it is only necessary to insert a condenser in one leg of the signal connection to remove this effect. For usual practice it is well to have the plates (each set) bridged by a 10-megohm resistor to avoid open circuit charging effects on the plates.

If a less expensive circuit for the sweep is desired, at the sacrifice of linearity, the filament transformer and 58 tube may be omitted, and the plate connection on the 58 joined to the cathode terminal with a 50,000- to 100,000-ohm resistor. This is not as satisfactory as the com-

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**A balanced selection of good technical books, additional to the A.R.R.L. publications, should be on every amateur's bookshelf. We have arranged, for the convenience of our readers, to handle through the A.R.R.L. Book Department those works which we believe to be most useful. Make your selection from the following, add to it from time to time and acquire the habit of study for improvement.** *Prices quoted include postage.* **Please remit with order.**

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**FUNDAMENTALS OF RADIO,** *Second Edition, by R. R. Ramsey.* A modernized revision of the author's work which has been a favorite with amateurs and experimenters since 1929. 426 pages, 439 illustrations. Price ..... **$3.50**

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You know that the F. C. C. makes frequent changes in amateur regulations? That many of these changes deal with the rules for getting new licenses and renewals? That when the regs are changed, the appropriate questions are changed in the license examination, and the answers have to be different? ▪ To keep pace with these changes, The Radio Amateur's License Manual is frequently revised. It is now in its seventh edition. Moreover, each copy is, when necessary, accompanied by a change sheet summarizing any changes that have been made since it went to press. ▪ The License Manual is as invaluable to the practising amateur as it is to the aspirant — but only if it is the current edition.

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plete circuit described, but will give usable sweep voltages. The rest of the circuit remains the same.

A B C

*FIG. 8—TYPICAL TRAPEZOIDAL MODULATION PATTERNS*

***That of C represents out-of-phase signal voltage input, which should not occur when the audio voltage is taken from the modulator's output circuit.***

For further circuits the reader may refer to *RCA Cathode Ray Tube Manual* and Rider's *The Cathode Ray Tube at Work*.

---

## What They Don't Know Won't Hurt Them

(*Continued from page 31*)

and all the while I am getting hungrier and hungrier for some good home cooking, and the baby is making his permanent home at my mother-in-law's."

He sighs like an old-time blacksmith's bellows, and sadly bows his head.

"Right now, fellows, she is busy winning the DJDC contest, and I am in the doghouse again."

Now this guy's story touches our hearts and we invite him to have a couple more and then come over to BXI's and have a listen around the band. But he thanks us and declines, and the last we see of him, the poor fellow is shuffling off down the street. As he reaches the corner, he turns, and with a tear in his eye yells back, "Remember, boys, it is better to argue and operate than not to pound the brass at all. What they don't know won't hurt 'em!"

To this epitome of wisdom we gently agree, and as we wend our way homeward I begin to think about what the gentleman has said.

So when I get back home on Monday, I take the code practice set which I have bought for the little woman and throw it out into the ashcan in the backyard, along with the copy of "How to Become a Radio Amateur" which she has on the kitchen table. And now we are still arguing about radio on Monday, Wednesday and Fridays, and I am working DX on Tuesday, Thursday and Saturdays and we are both comparatively well satisfied.

## Strays

A disgusted ham wants to nominate a certain W6 as Champion CQ Hound, his claim to the title resting on a series of 58 CQ's (from time of starting the count) then two signs and another batch of 51! If anyone wants to try beating this record, we suggest putting one hand on the tank coil and a bare foot on the filament transformer before starting.

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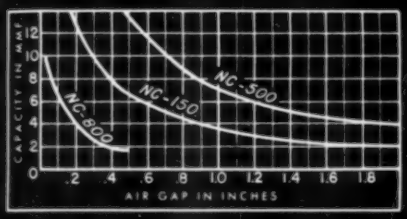
National pioneered the unusual design of these neutralizing condensers. Widespread use has proved the soundness of their principle and the honest quality of their construction. All sizes have both plates insulated by Isolantite, and have heavy aluminum plates machined to a smooth rounded edge.

Three sizes are offered. The smallest (Type NC-800, Net Price $1.80) is suitable for the RCA-800, EIMAC 35T, 50T and similar tubes. The next larger size (Type NC-150, Net Price $3.60) is for tubes like the HK-345, RK-36, 150-T, 300-T and 852. The largest size (Type NC-500, Net Price $6.00) is suitable for the WE 251A and similar tubes.

The chart at the left shows the capacity in mmf. for various settings of the spacing between the plates.

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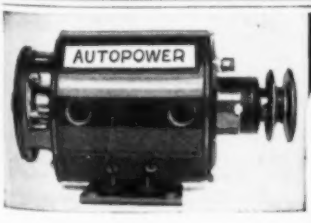


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*Insignia*

OF THE

# Radio Amateur

▶ In the January, 1920 issue of *QST* there appeared an editorial requesting suggestions for the design of an A.R.R.L. emblem — a device whereby every amateur could know his brother amateur when they met, an insignia he could wear proudly wherever he went. There was need for such a device. The post-war boom of amateur radio brought thousands of new amateurs on the air, many of whom were neighbors but did not know each other. In the July, 1920 issue the design was announced — the familiar diamond that greets you everywhere in Ham Radio — adopted by the Board of Directors at its annual meeting. It met with universal acceptance and use. For years it has been the unchallenged emblem of amateur radio, found wherever amateurs gathered, a symbol of the traditional greatness of that which we call Amateur Spirit — treasured, revered, idealized.

Do You Wear the A.R.R.L. Pin ?

THE LEAGUE EMBLEM, with both gold border and lettering, and with black enamel background, is available in either pin (with safety clasp) or screw-back button type.

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- Red enameled background for the SCM.
- Blue enameled background for the ORS or OPS.

(Red available in pin type only. Blue may be had in either pin or button style.)

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ALL EMBLEMS PRICED THE SAME

*50 cents, postpaid*

AMERICAN RADIO RELAY LEAGUE

West Hartford Connecticut


## New Tubes

(*Continued from page 87*)

No heater supply is required. Operating conditions are as follows:

| | |
|---|---|
| D.C. voltage output | 300 volts max. |
| D.C. output current | 30 ma. min. |
| | 75 ma. max. |
| Peak plate current | 200 ma. max. |
| Starting voltage | 300 volts peak, min. |
| Voltage drop (dynamic) | 24 volts average |

The characteristics of the tube are independent of the operating temperature. As is usual with gas-filled tubes, there is some tendency to generate r.f. noise, which can be eliminated by proper filtering and shielding.

The OZ4G has a miniature glass bulb with small octal base. Pin connections are as follows: Pins 1 and 7 no connections; Pin 8, cathode; Pin 3, anode; Pin 5, anode. Pins 2, 4 and 6 are omitted from the base.

### The 6H5

The 6H5 is a third member of the indicator-tube group, the other two being the 6E5 and 6G5. The 6H5 is similar to the 6G5 except that the current to the target is controlled by a grid tied to the cathode within the tube instead of by emission saturation as in the 6G5. The addition of the grid gives an "hour-glass" effect to the pattern, since a fixed 90-degree shadow appears opposite the controlled shadow. Characteristics and operating conditions are as follows:

| | | | |
|---|---|---|---|
| Heater voltage | | | 6.3 volts |
| Heater current | | | 0.3 volts |
| Plate supply | 100 | 200 | 250 volts |
| Triode plate resistor | 0.5 | 1.0 | 1.0 megohm |
| Target voltage | 100 | 200 | 250 volts |
| Target current (app.) | 1.5 | 3.5 | 4.5 ma. |
| Grid voltage for zero shadow angle | −8.0 | −10.5 | −22.0 volts |
| Grid voltage for 90-degree shadow angle | 0 | 0 | 0 volts |

The 6H5 is identical with the 6G5 in size and basing. It also has the same pin connections.

### The 25L6

The 25L6 is a new all-metal beam tube for use in the output stage of a.c.-d.c. receivers, giving an output of slightly better than 2 watts with 110 volts on the plate. The efficiency and power sensitivity are high. In the operating data given below, it will be noted that slight changes in the grid bias and load resistance will produce marked changes in the character of the distortion, although the total distortion does not vary greatly. Characteristics, ratings and operating conditions are as follows:

| | | | | |
|---|---|---|---|---|
| Heater voltage | | | | 25.0 volts |
| Heater current | | | | 0.3 amp. |
| Plate voltage | 110 | 110 | 110 | 110 volts max. |
| Screen voltage | 110 | 110 | 110 | 110 volts max. |
| Grid voltage | −7.5 | −7.5 | −8 | −8 volts |
| No-signal plate current | 49 | 49 | 45 | 45 ma. |
| Max.-signal screen current | 55 | 51 | 52 | 48 ma. |
| No-signal screen current | 4 | 4 | 3.5 | 3.5 ma. |
| Max.-signal screen current | 8 | 10.3 | 8 | 10.5 ma. |

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**FLASH!!**
TWO 866's
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**CONGRATULATIONS**
to George Grammer of *QST* on such a FB rig as presented on page 28 of December *QST*. Harvey is pleased to offer the kit as shown in the write up, complete with tubes and valpey VM2 xtal and coils for any band, **$18.95.** Power supply for above 4-band xmtr complete with tube and cable, **$7.95.**

New **COTO** inductors with and without links in stock at all times.

**BLILEY** xtals, type VF1 new low drift variable frequency unit—equal to over twenty separate old style xtals, **$8.00.**

**TYPE HF2** — The answer to the ultra high problem — a 14 mc xtal that can take a beating and like it — thicker than most 7 mc xtals — mounted in victron G and carrying Bliley dependable guarantee — *only* **$6.50.**

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Harvey Radio Company is pleased to announce its large line of equipment is now complete with the addition of a large stock of Bliley xtals and National parts and receivers at lowest prices.

**NEW**
**Twin 15 Oscilloscope**
Complete and ready to go at the sensationally low price of
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Comes complete with new RCA 913 and RCA 80 tubes, self contained power supply made of highest quality parts such as UTC, Cornell, Dubilier, IRC, Centralab. The first dozen hams to order this instrument will receive them completely wired and tested in our labs. To the next dozen hams, we will give free a copy of the RCA Book on Cathode Ray tubes. The uses of this little rig are unlimited.

In these *Oil-Impregnated* and specially processed *Transmitting Condensers*, amateurs will find a happy balance of *Economy* and *Quality*. Designed to fill the demand for a low priced condenser, no effort has been spared to embody in it every modern engineering advancement. *Quality . . . High Performance . . . Dependability.*

**QUALITY AT AN UNHEARD OF PRICE!**

| | | |
|---|---|---|
| **1000 Volts, D. C. Working Voltage** | | |
| 1 mfd. | *Special* | **$1.10** |
| 2 " | *Special* | **1.50** |
| 4 " | *Special* | **2.00** |
| **1500 Volts, D. C. Working Voltage** | | |
| 1 mfd. | *Special* | **$1.45** |
| 2 " | *Special* | **2.00** |
| 4 " | *Special* | **3.25** |
| **2000 Volts, D. C. Working Voltage** | | |
| 1 mfd. | *Special* | **$1.75** |
| 2 " | *Special* | **2.45** |
| 4 " | *Special* | **4.65** |
| **3000 Volts, D. C. Working Voltage** | | |
| 1 mfd. | *Special* | **$2.50** |
| 2 " | *Special* | **4.95** |

Hermetically sealed in steel containers, beautifully black japanned, these compact condensers do credit to the most pretentious transmitter. Provided with high, glazed porcelain insulated terminals. *A Real Condenser at a Really Low Price.*

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| | |
|---|---|
| RK39 | **$3.50** |
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| RCA 808 | **10.00** |
| Taylor T-20 | **2.54** |
| RCA 913 | **5.60** |
| RCA 807 | **3.90** |

See page 111, December *QST*, for full details about **Harvey Model X Transmitter Kit** and **Model "A" Amplifier Kit.** Price from **$15.00** up.

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**THE VALPEY CRYSTALS**

377 SUMMER STREET MEDWAY, MASS.


| | | | | |
|---|---|---|---|---|
| Plate resistance (app.) | 10,000 | 10,000 | 10,000 | 10,000 ohms |
| Transconductance | 8200 | 8200 | 8000 | 8000 micromhos |
| Load resistance | 1500 | 2000 | 1500 | 2000 ohms |
| Distortion | | | | |
| Total harmonic | 11 | 10 | 13 | 11.5 per cent |
| Second harmonic | 10 | 3.5 | 12 | 4.5 per cent |
| Third harmonic | 4 | 8.5 | 4.5 | 9.5 per cent |
| Power output | 2.1 | 2.2 | 2.2 | 2.2 watts |

The 25L6 is the same physical size as the 6F6, has a 7-prong octal base with pin connections the same as for the 6L6. The tube would appear to be of interest in low-power transmitting applications for those in the d.c. districts, or for lightweight portables operating from a.c. without a power transformer. It has the high power sensitivity which is characteristic of the 6L6.

---

### Auto-Transformer Design

(*Continued from page 45*)

The current in section *AB* is:

$$2.73 \times .33 = .90 \text{ amperes}$$

The size wire to use in each section can be determined from a wire table. The *Handbook* advises using 1500 circular mils per ampere; however, I find that 1000 c.m. per ampere will carry the current without heating.

Based on 1000 c.m. per ampere, No. 20 wire should be used in the section AB and No. 17 wire in section BC. The cost of the wire for this particular transformer would be about a dollar, and the core can be procured from a service man free,

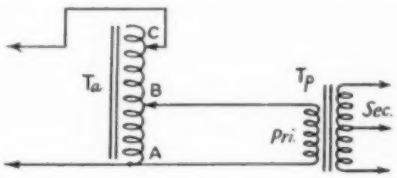


*FIG. 1*

or at a maximum cost of two bits. Remember that the larger the core the smaller the amount of wire needed. The amount of wire necessary for any particular job can of course be estimated from the number of turns used, size of core, number of layers, etc. If you are new at winding transformers the information in the *Handbook* is very helpful, and should be read before construction is attempted.

The transformer described here is merely used as an example to show how easily an auto transformer can be designed.

If voltages between 76 and 115 are to be taken from this transformer, taps between could be made on the winding between *B* and *C* at the proper intervals to get the desired potentials, provided the wire in this section is made larger to carry the increased current flowing between the tap and end *C*.

The auto transformer has many uses and, at the low cost necessary to build one, should be of considerable value to any amateur station.

# *Buying a New Transmitter? . . .*

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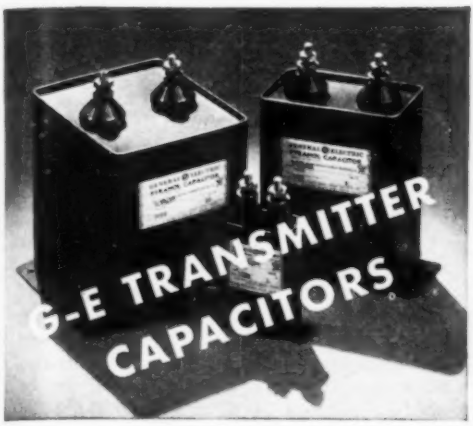


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Transmitter Manufacturers: See your nearest G-E office for more information about G-E capacitors, or write Radio Dept., General Electric, Schenectady, New York.

360-120

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***By* CLINTON B. DESOTO**

THERE'S a new topic of conversation in amateur radio these days. It starts off with the question: "Have you read Clint DeSoto's new book on ham history? 'Two Hundred Meters and Down', you know? "

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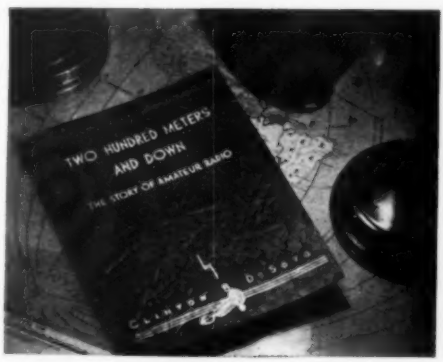
You owe it to yourself, as an amateur, to learn from this book the fundamental why's and wherefore's of amateur radio. You owe it to yourself, as an individual, to provide yourself with the evenings of thrilling entertainment surging between the attractive gold-lettered deep red covers of "Two Hundred Meters and Down: The Story of Amateur Radio."

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## R.F. Voltage and Current Ratings

(*Continued from page 43*)

tion of the current or voltage becomes necessary. Referring to Fig. 1, which is the diagram of an r.f. power amplifier stage, $C_1$, $C_2$, $C_3$ and $C_4$ are usually mica condensers. The preferred size seems to be 0.002 μfd. The current flowing through $C_2$ is equal to the r.f. current flowing through the tube, and this same current must also flow through $C_3$ and $C_4$ in parallel. Therefore, $C_2$ passes twice as much current as $C_3$ and $C_4$. Approximately, the current through $C_2$ will not exceed 0.7 times the direct plate current.

On the other hand, one may consider the tube as a generator with a voltage of $mu$ times the applied grid voltage. This voltage is applied to a circuit consisting of the tube's a.c. resistance, the equivalent resistance of the tuned circuit, the reactance of $C_2$, and that of the two condensers $C_3$ and $C_4$ in parallel. When all these impedances are known the current can be calculated. Since the condenser reactances are small compared to the other quantities, no great error will be introduced by ignoring the by-pass condensers and considering only the tube and the load in series. The tube's a.c. plate resistance can be obtained from the manufacturer's ratings [2] and can also be taken from a family of plate characteristics. The equivalent resistance of the parallel tuned circuit is given by the equation

$$R_1 = \frac{CR}{L}$$

where $R_1$ is the equivalent resistance of the circuit and $R$ is the r.f. resistance of the coil plus the r.f. resistance of the tuning condenser.

—···—

Plate by-pass or blocking condensers, provided they are of any reasonable size (500 μμfd. or more), are not called upon to withstand much r.f. voltage, even with high-power amateur transmitters at the lower frequencies. It is safe, therefore, to use condensers rated for the maximum d.c. plate voltage, allowing the usual factor of safety. However, where condensers are called upon to carry r.f. current of the order of amperes (as might be the case when fixed condensers are put in series with direct-coupled feeders for insulation purposes, or inserted in tuned circuits for blocking purposes) it will be necessary to consult the manufacturer's current and voltage ratings before selecting a suitable condenser. Remember, too, that grid coupling condensers in capacity-coupled circuits are called upon to withstand the driver plate voltage plus the amplifier bias voltage, in addition to carrying considerable r.f. current. —*G. G.*

[2] This value applies only in audio applications. The r.f. plate resistance is considerably different from that obtained by static measurement. Likewise, it is difficult to determine the value of $R$ in the equation which follows, in r.f. circuits. The first method of calculation is to be preferred for r.f. power amplifiers.—Editor.

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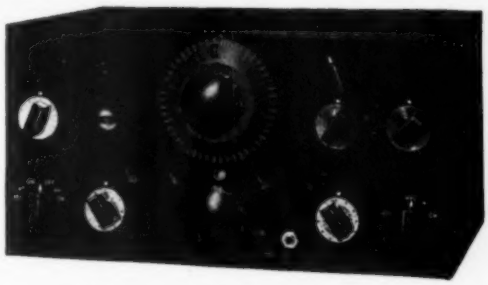

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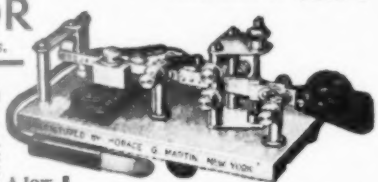

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## Testing Transmitting Tubes

(*Continued from page 48*)

tube. Now adjustments of the resistors must be made in small steps, beginning with low voltages, until the voltages are as specified for this trial. When the voltages are all checked, the plate current reading is noted and the tube is allowed to continue operation under these conditions for several minutes, in order to show whether the filament emission will decrease with operation. A good point on a second curve is now selected, say the 800-volt point on the −25-volt curve. With the controls readjusted to these new voltages, the screen having been checked following the changes in the other adjustments, the plate current is noted as before. Whether the tube complies with its rated characteristics, and the divergence from those characteristics, will readily show its actual condition.

It sometimes occurs that a good tube is momentarily subjected to an overload, with the result that its filament emission is lost temporarily. In many cases, the tube may be restored to its normal emission by the application of its rated voltage, or a voltage up to 20% higher than its rated voltage (grids and plate are left disconnected throughout this process) until the normal activity of the filament is restored.

Such a test as the one outlined above (with the 860 tube as an illustrative example) should give the operator a complete and accurate knowledge of the condition of a tube. Common-sense care should be used in making these tests, of course.

## Strays

Hams who like to build measuring equipment will be interested to know that a new type of precision plug-in resistor, inexpensively priced, is now available. Rated at an accuracy within 1/10 of 1 per-cent, the units are mounted in a standard 4-prong tube base, and can be obtained in selected resistance values, suitable for bridge purposes, from 1 to 10,000 ohms. They are made by the Clarostat Manufacturing Company, Brooklyn.

—···—

A note from W9DOS which may be of help to FB-7 receiver owners who use their own power supplies: With the full tube complement in place, the filament voltage drop through the cable is about three-tenths of a volt, which, with a transformer giving only 2.5 volts to start, makes the voltage at the tubes too low for really good operation. W9DOS cut off about three feet of the cable and mounted his power supply on a shelf underneath the operating table. This brought the filament voltage up to the rated 2.5, and made the receiver sound like a new one.

—···—

The old ham spirit: When the filament transformer arced over and the insulation caught fire at N3BVG, the NCR Armory station, N1EZV and N8KOX kept blowing out the flames while N3CBF continued his QSO with W3AKG and arranged for a sked at a later date under more favorable conditions!